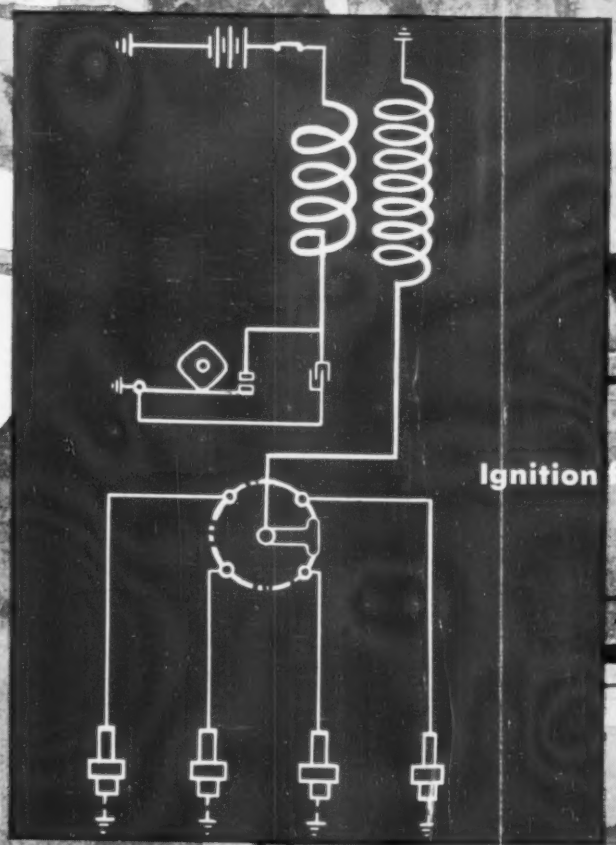
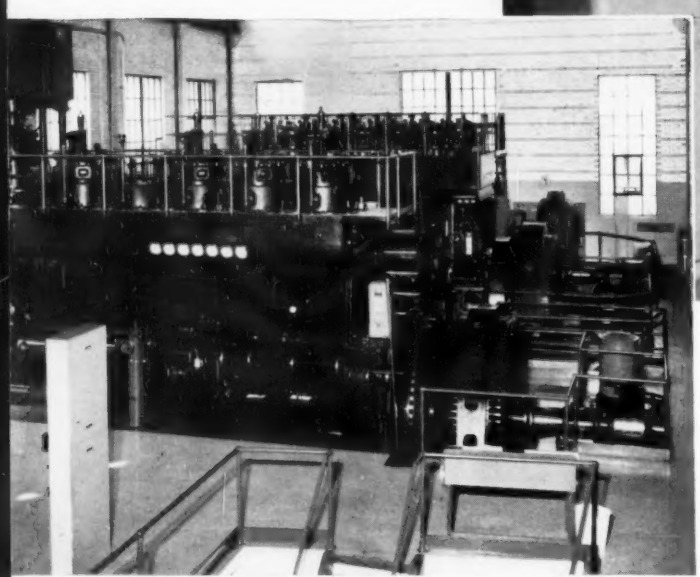
diesel power

JUNE 1954



Ignition for High-compression Engine

OPERATE YOUR DIESELS FOR LESS...



Original diesels got so much better lubrication with Texaco that Texaco was naturally the choice when a new radial diesel was installed.

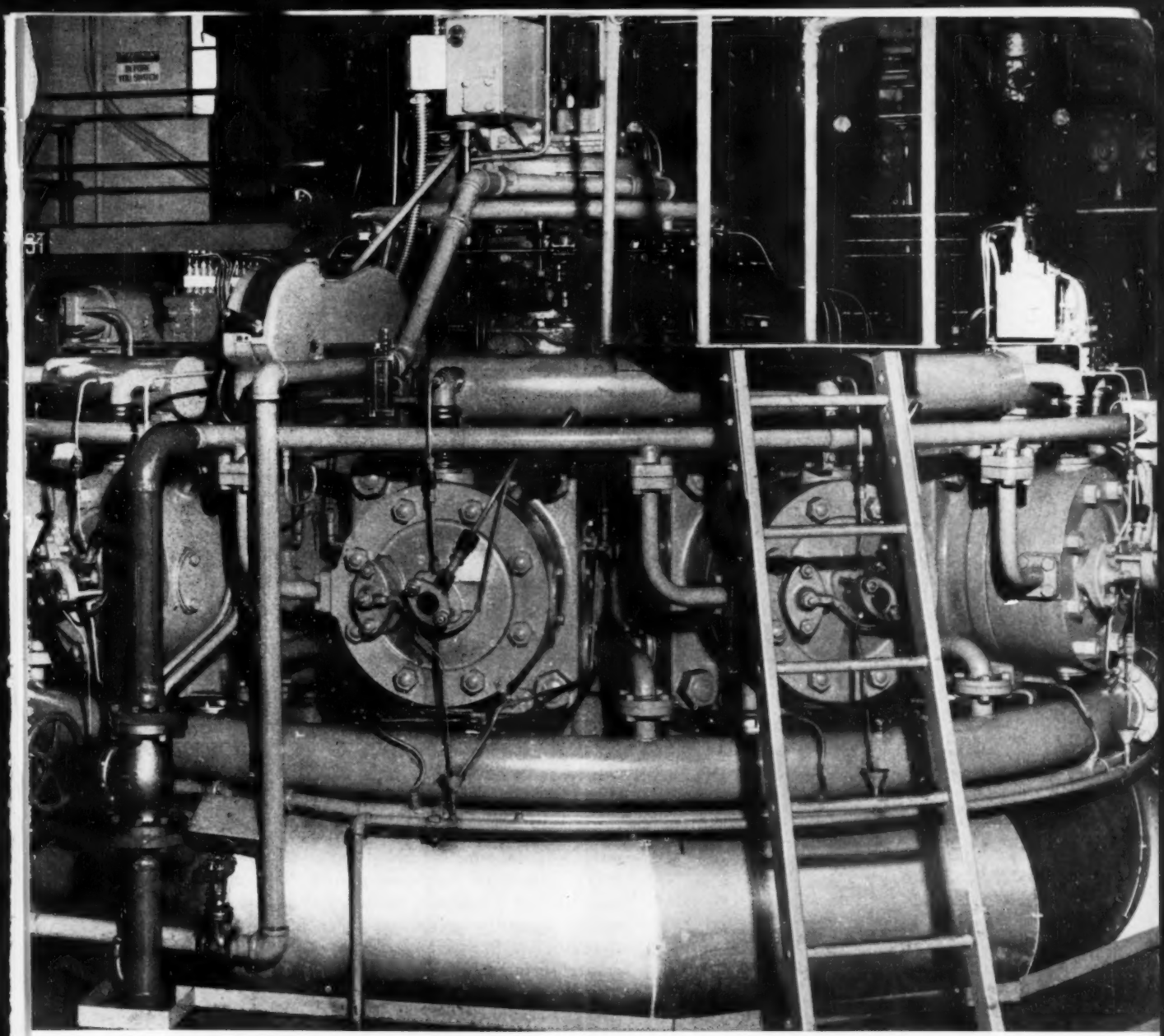
FOLLOW the example of a Michigan utility company (name on request). Here's what they say—

"We got so much better lubrication with Texaco . . . lower maintenance costs and fuel economy . . . that when we installed a new diesel . . . we naturally chose Texaco to lubricate it. As new diesels go into our plant . . . Texaco is going in with them."

This company uses world famous *Texaco Ursa Oil.*

TEXACO

TEXACO



There is a complete line of *Texaco Ursa Oils* especially refined to make diesel, gas and dual-fuel engines give *more power* with *less fuel* over *longer periods* between overhauls. That is why—

For more than twenty years, more stationary diesel horsepower in the United States has been lubricated with Texaco than with any other brand.

There is a member of the *Texaco Ursa Oil* series exactly right for your diesels, whatever their size, type, speed and fuel, or operating conditions. A Texaco Lubrication Engineer will gladly help you select the one to assure greatest efficiency and lowest maintenance costs.

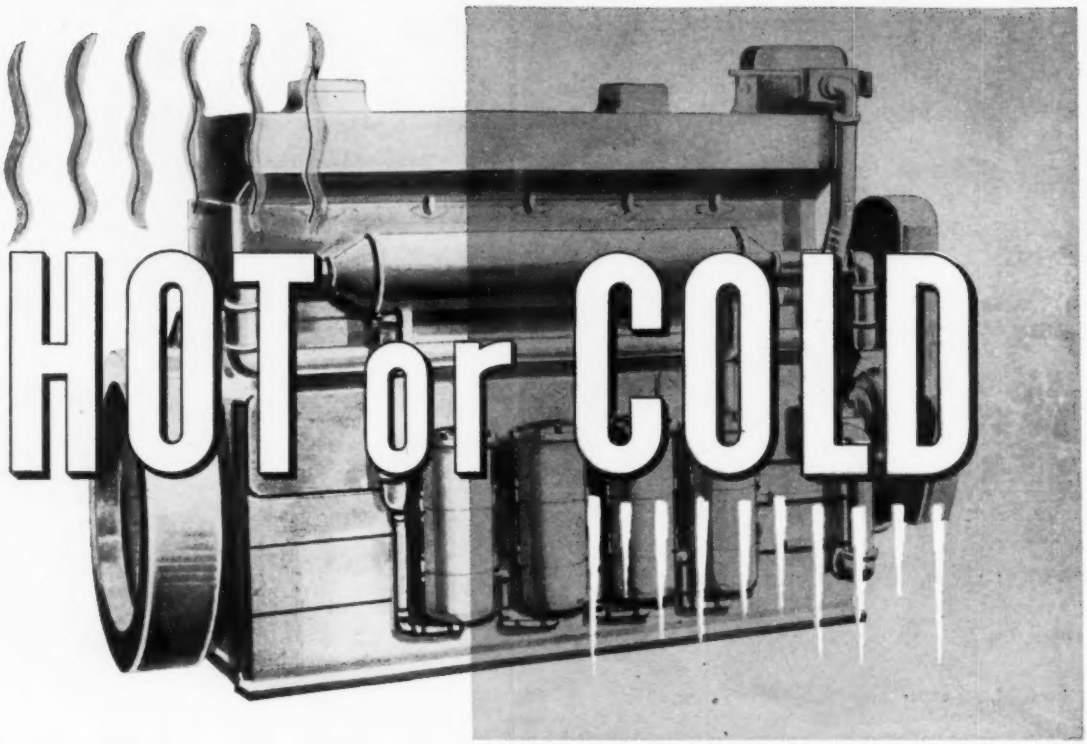
Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

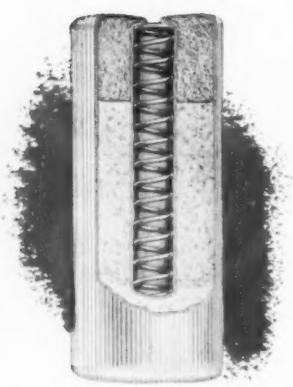
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES



PROTECTED AT ALL TIMES



CP* Controlled Pressure elements are the subject of an interesting and helpful booklet, that can save you money. Write for your copy today — it's free, of course.

You know that engines are completely protected only if the lube oil is filtered under *all* conditions. It is essential that dangerous particles be removed when the oil is cold and viscous, just as it is under normal operating temperatures. When you have less than full-flow filtration, you may not be protecting critical surfaces, if a part fails or if oil is contaminated at the start, because the oil is by-passed around the filter element.

In a Winslow CP* element, cold oil *immediately* flows through the coarser section of filter material, which accepts the oil and removes all critical particles. As the temperature rises, more of the oil flows through the dense section of the element, assuring complete filtration at all times. The proportion of coarse and dense filtering media has been determined by laboratory research and field testing for each size of filter, and is an exclusive design feature of Winslow CP elements.

Winslow filters are your assurance of longer oil life and maximum engine protection under all operating conditions.

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diesel power

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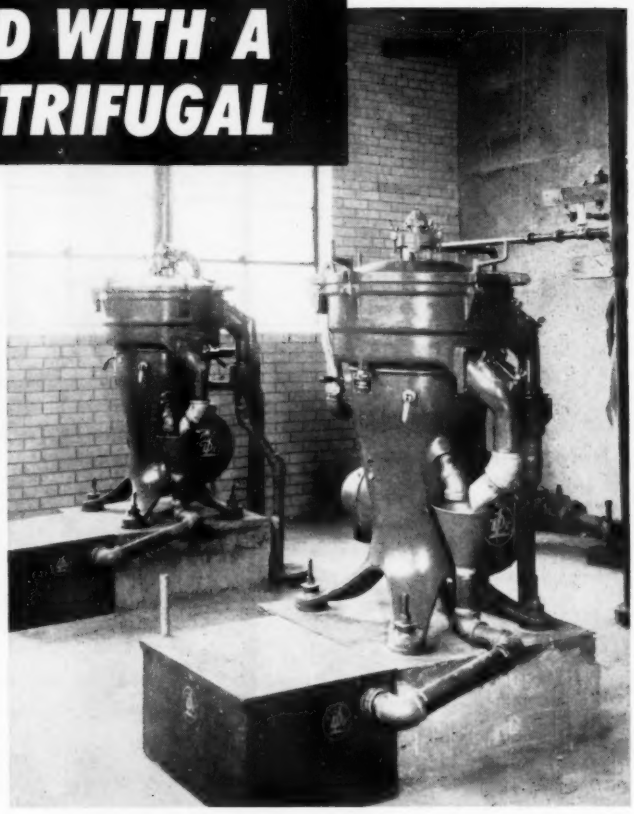
This Month's Cover

A schematic of a simple ignition circuit punched out on the background of a modern high-compression natural gas engine symbolizes how vital ignition systems are to efficient engine operation.

TO CUT FUEL COSTS..... BURN RESIDUALS, PURIFIED WITH A DE LAVAL CENTRIFUGAL



Many diesel-powered plants, ashore and afloat, are successfully burning heavy fuels with resulting large economies*.

They are purifying the residuals with De Laval Oil Purifiers—the most effective means ever devised for the purpose, as proved by efficiency comparison tests.

De Laval Oil Purifiers remove a *maximum* amount of incombustible solids—and do it at constant operating efficiency.

It will pay you to investigate the profit possibilities of burning a less costly fuel, purifying it the *De Laval* way. Write for complete information.

FOR EXAMPLE...

The Keystone Heights, Florida, plant of the Clay Electric Co-op burns straight residual fuels ranging in viscosity from 110 to 166 Furol at 122° F. and in API gravity from 13.5 to 9.4, running them through a De Laval Purifier. The savings, says the Chief Engineer, amount to as much as *$4,500 per month.*

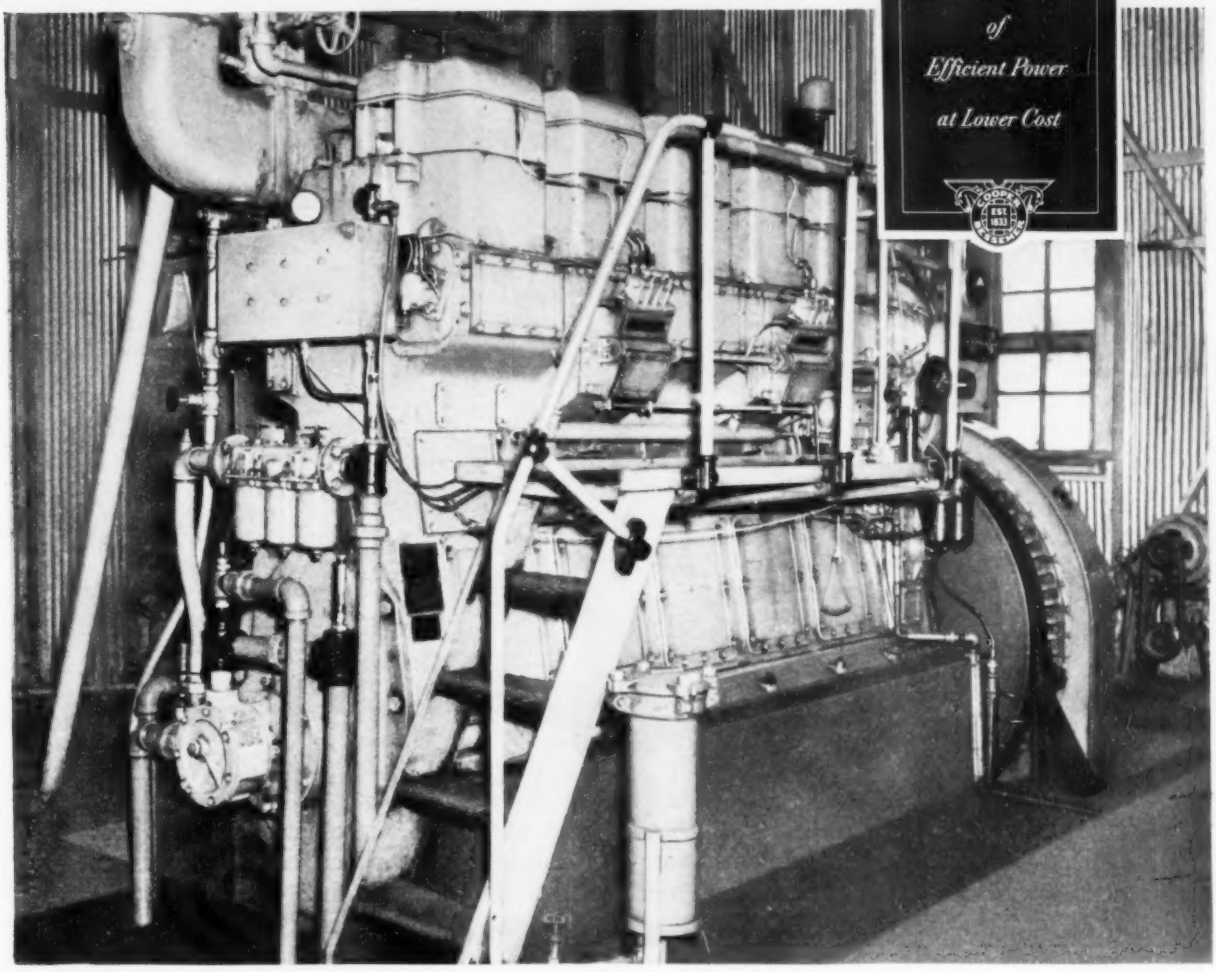
THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York ● 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5

DE LAVAL

HEAVY OIL PURIFIERS

Installed at Uvalde Rock Asphalt Company's quarry, Blewett, Texas, this 430 hp Cooper-Bessemer JS-5 diesel drives a 300 kw generator for general power requirements.

Another Example of Efficient Power at Lower Cost



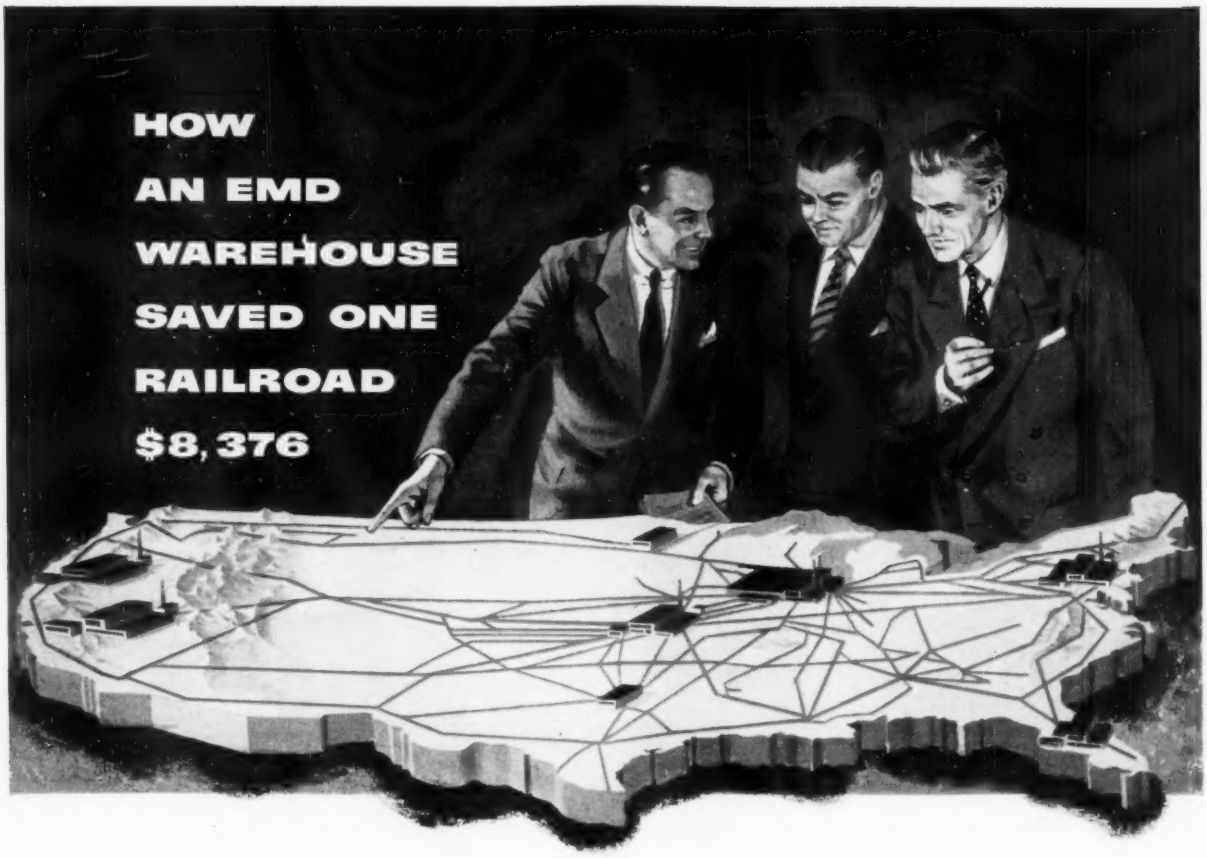
Steady worker, good at keeping costs DOWN!

THE Uvalde Rock Asphalt Company, which produces about 500,000 tons of limestone rock asphalt a year, needed a diesel that would stand up to steady work month in, month out. And that's just what they have in the Cooper-Bessemer JS-5 shown above. This efficient, husky diesel, installed in 1946, has done a steady job right from its initial start, with a very minimum of attention and replacement parts. Like other Cooper-Bessemer engine types, larger and smaller, the JS consistently shows records of low-cost operation. It has all the Cooper-Bessemer features that pay off every time.

The **Cooper-Bessemer** *Corporation*

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York Washington, D. C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Gloucester, Mass. New Orleans, La.



TO RAILROADS, quick delivery of Diesel locomotive parts from regional warehouses can often mean significant cost savings.

Take the case of one line:

Instead of getting parts from a distant main plant, they started ordering from the Electro-Motive regional warehouse serving their territory. Delivery time dropped sharply, the road reduced its lead time on orders, and in a few months was able to cut its inventory by $8,376.

Electro-Motive's 8 Regional Warehouses and Factory Branches also help cut lost locomotive time which costs railroads at least $100 a day. With 24-hour delivery in emergencies, railroads no longer need to keep their Diesels standing idle for want of a spare part.

Dependable parts supply is just one of the "after the sale services" railroads get when they invest in General Motors Diesel locomotives. For details on other services which back up performance of the great new line of General Motors locomotives, write for booklet "Safeguarding Railroad Earnings."

The Best Locomotives Are Even Better Today!

EMD "Parts with a pedigree"

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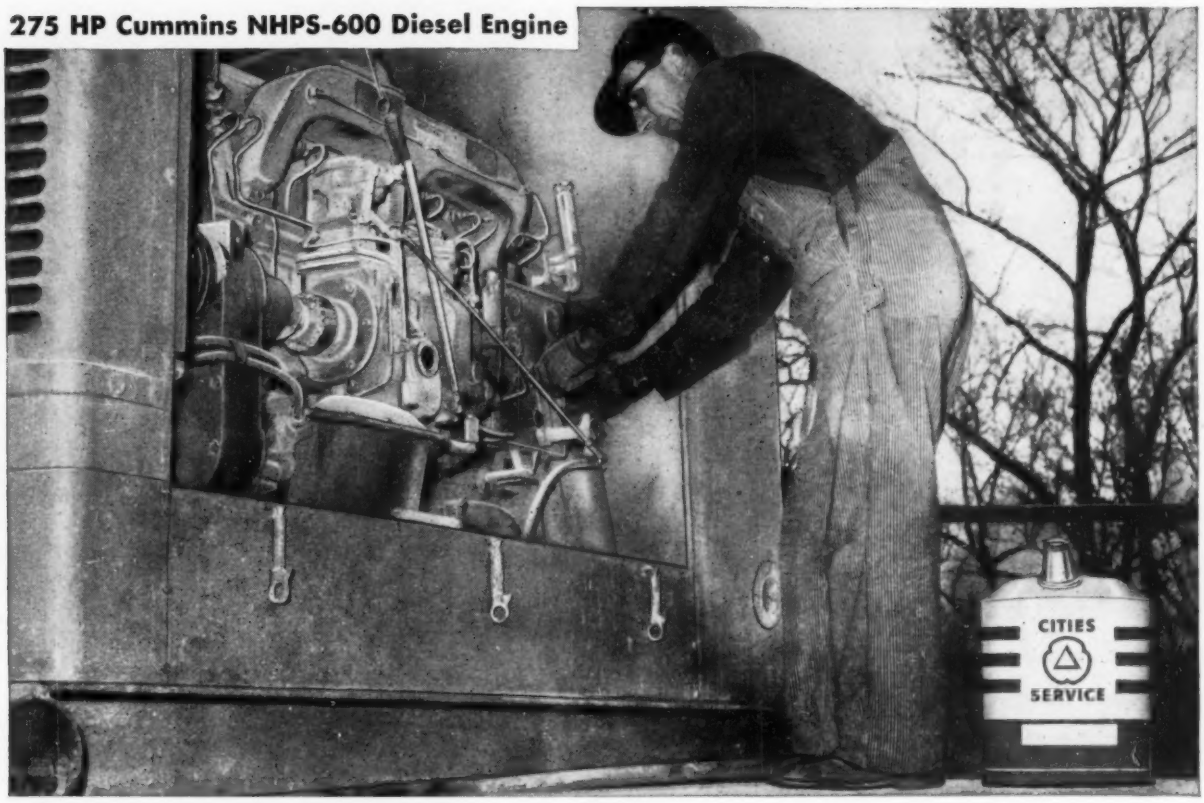
275 HP Cummins NHPS-600 Diesel Engine



6 YEARS OLD...ORIGINAL RINGS, BEARINGS USING CITIES SERVICE DC-300 DIESEL OIL

Portable Lime Pulverizer of C. B. Seamans Chalks Up Phenomenal Performance Record

Credit C. B. Seamans of Reedsburg, Wisconsin, with a remarkable invention—a portable lime pulverizing plant which completes the cycle from crusher to storage bin under control of one operator! And credit Cities Service DC-300 Diesel Oil for the remarkable maintenance record of this unique machine. From the beginning, only DC-300 oil was used to lubricate the pulverizer's powerful 275 HP Cummins NHPS-600 Diesel engine. After three years' operation, wear on the connecting rod bearings checked out at .0005". No bearings or rings were replaced, and the engine has now completed its sixth year of service.

Cities Service lubricants can help assure outstanding performance for your stationary or mobile diesels, too. For details, contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N.Y.

FROM CRUSHER TO STORAGE BIN—A ONE MAN OPERATION. C. B. Seamans' unique lime pulverizer is a portable, diesel-powered machine that requires only one operator to regulate process which completes entire cycle from crusher to storage bin. Lubricated by Cities Service DC-300 Diesel Oil, the machine has been operating for six years on original rings and bearings!

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

SPEED SENSITIVE SWITCHES

Synchro-Start has re-designed its line of SPEED SENSITIVE CONTROLS in one, two and three switch units so that they will give still longer life, better accuracy and be more economical to build.

These speed sensitive switches are available in two body designs. The GS Series is adaptable to standard distributor take-off to accommodate gear or coupling drives and the rotating parts run in oilless bronze bushings. The GH body design is for standard SAE tachometer drive and runs in oil sealed ball bearings, lubricated for life.

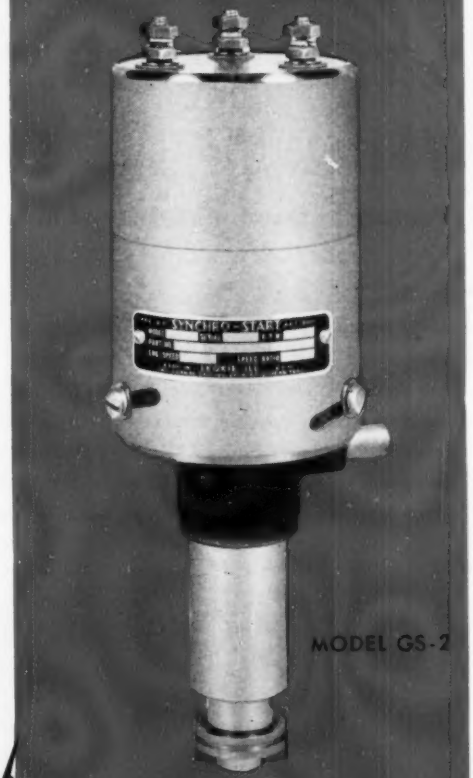
These units contain two snap action switches rated at 10 Amps.-110 Volts A.C. and can be used for either opening or closing circuits at any RPM over 350. Each switch is individually adjustable up to 2000 RPM above specified set speed.

The models shown here are designed for a two speed operation such as cutting out a starting motor and providing overspeed protection with manual or automatic re-set. The dust cap furnished is available with open terminals or a variety of standard or special connector fittings.

Write us for the correct model for your installation

Synchro-Start Products Inc.

MODEL GH-2

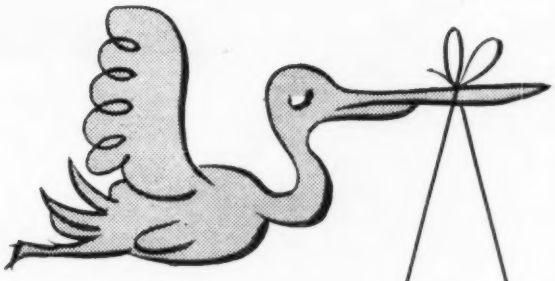


MODEL GS-2

Mfrs. of Automatic Engine Controls

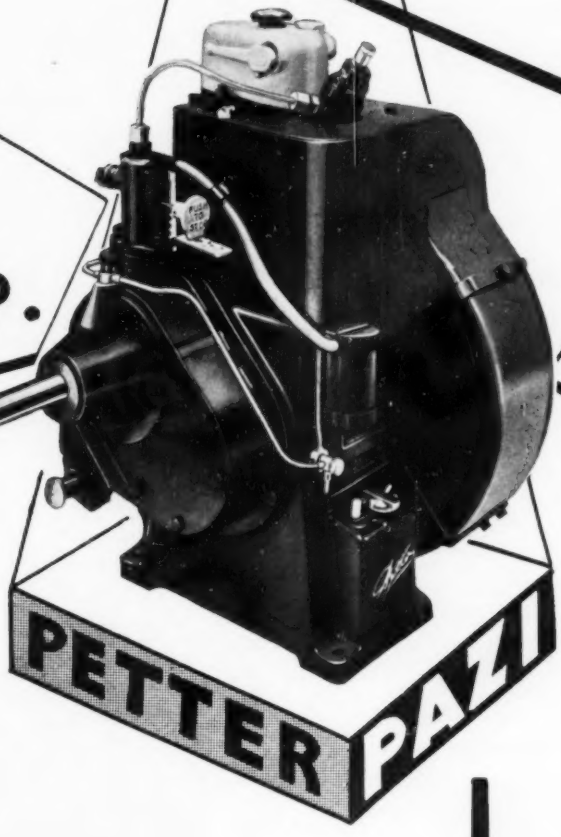
8151 N. RIDGEWAY AVE.
SKOKIE, ILLINOIS

A NEW ARRIVAL



To the Petter air-cooled diesel engine family

1½ & 2½ H.P.



Range NOW 1½ - 40 H.P.

BACKED BY A WORLD-WIDE PARTS AND SERVICE ORGANISATION FOR THE 360,000 ENGINES IN USE

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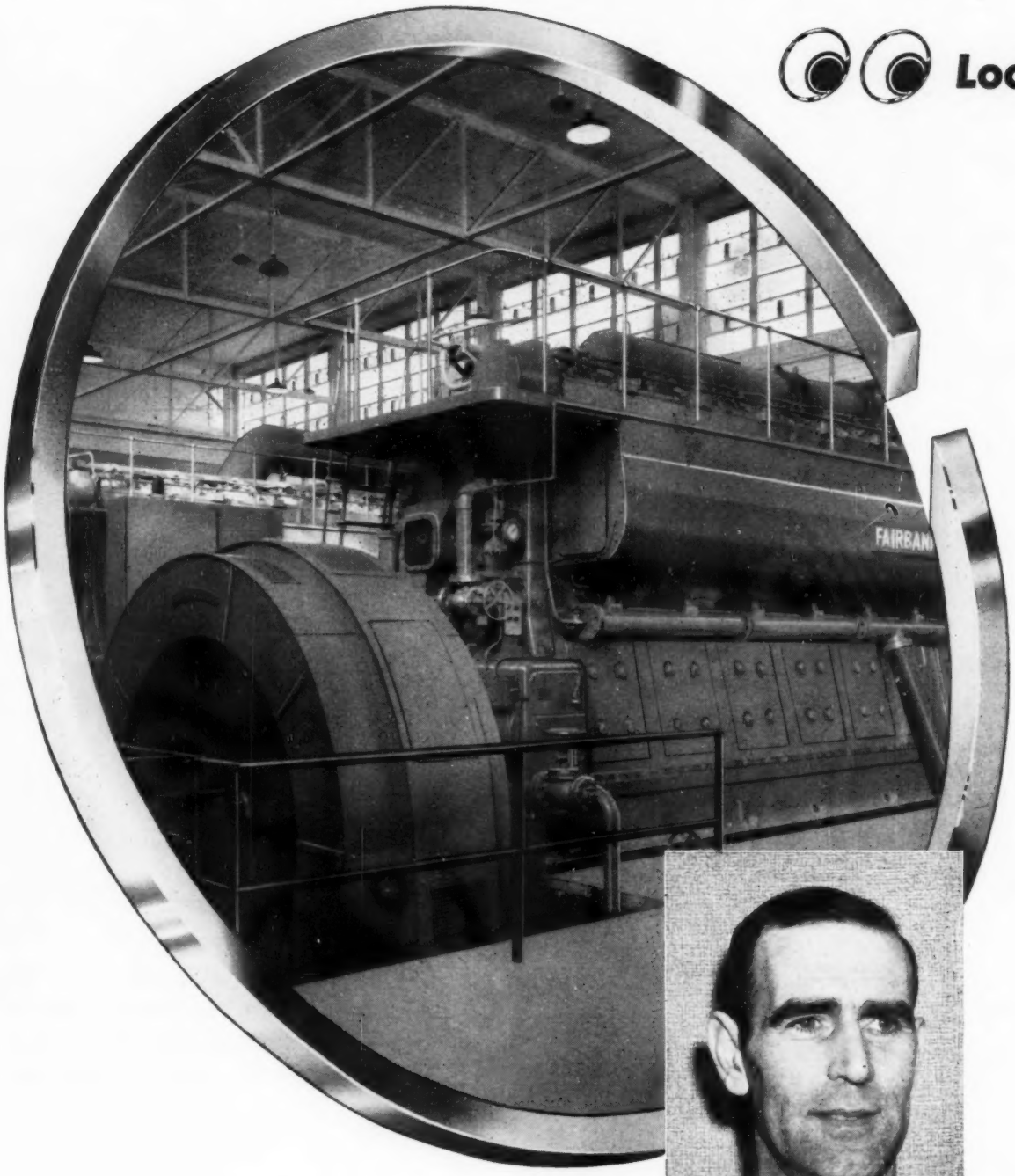
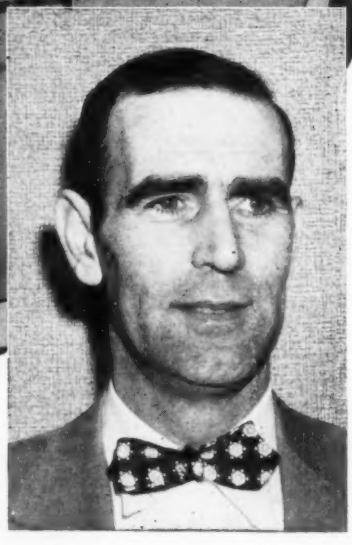
Office and Showroom 60-07 39th AVE, WOODSIDE, NEW YORK





Mr. John N. Keen,
Assistant Manager,
Wolverine Electric Cooperative

to COOK for Better Rings!

WOLVERINE'S
Award-Winning REA Plant Uses
COOK PISTON RINGS!

Still the champion! In 1953 — for the second year in a row — these three 3500-HP Diesels helped win Diesel Progress Magazine's Award for Wolverine Electric Cooperative's Johnson plant as *"the most efficiently operated of all REA internal combustion plants in the nation"!*

All three engines are equipped with Cook Piston Rings. In 1953, each unit averaged 6,613 operating hours, and generated an average of 11,660,167 kilowatt hours. Maintenance costs for all three engines came to less than $300 for materials, and less than 800 man hours — most of it to secure maximum control of the fuel-oil injection system!

Here's what Mr. John N. Keen, Wolverine Electric Cooperative's Assistant Manager, has to say about Cook Piston Rings:

"We are well satisfied with our Cook Piston Rings. We feel we have excellent lube oil control, as well as a minimum of cylinder wear. WITH ALMOST 14,000 OPERATING HOURS BEHIND THEM, THE CYLINDER LINERS ARE STILL IN VERY GOOD CONDITION. . . "

Mail coupon today for product information and name of your nearby Cook representative. C. Lee Cook Mfg. Co., Inc., Louisville 3, Kentucky.

TENSION THAT NEVER WEARS OUT!

Cook Piston Rings are tensioned on a Cook-designed machine which accurately controls the amount and distribution of tension. This exclusive process gently "squeezes" tension into the rings, with a series of small indentations—avoids harmful disarrangement of the rings' molecular structure. *The result is constant, uniform tension that never wears out!*

C. LEE COOK MANUFACTURING CO.

Sealing Pressures Since 1888

C. Lee Cook Manufacturing Co. — Dept. DPO-64
916 South 8th Street
Louisville 3, Kentucky

Gentlemen: Please send me complete information on Cook Piston Rings and name of nearest representative.

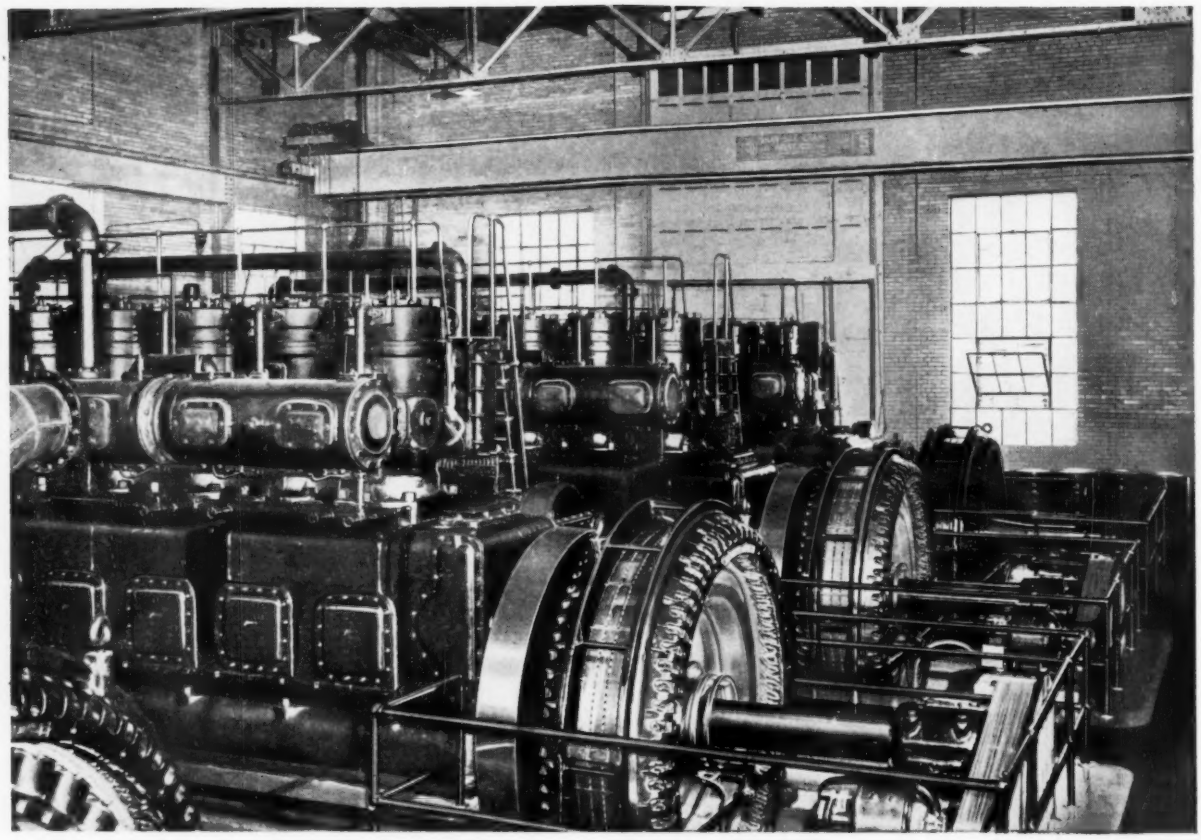
Firm_____

Street_____

City_____ State_____

Attention:_____

Type of Units_____



"We're Proud of This Plant!"

says Don H. Decker, — Plant Supt., Thumb Electric Cooperative, Ubly, Mich.

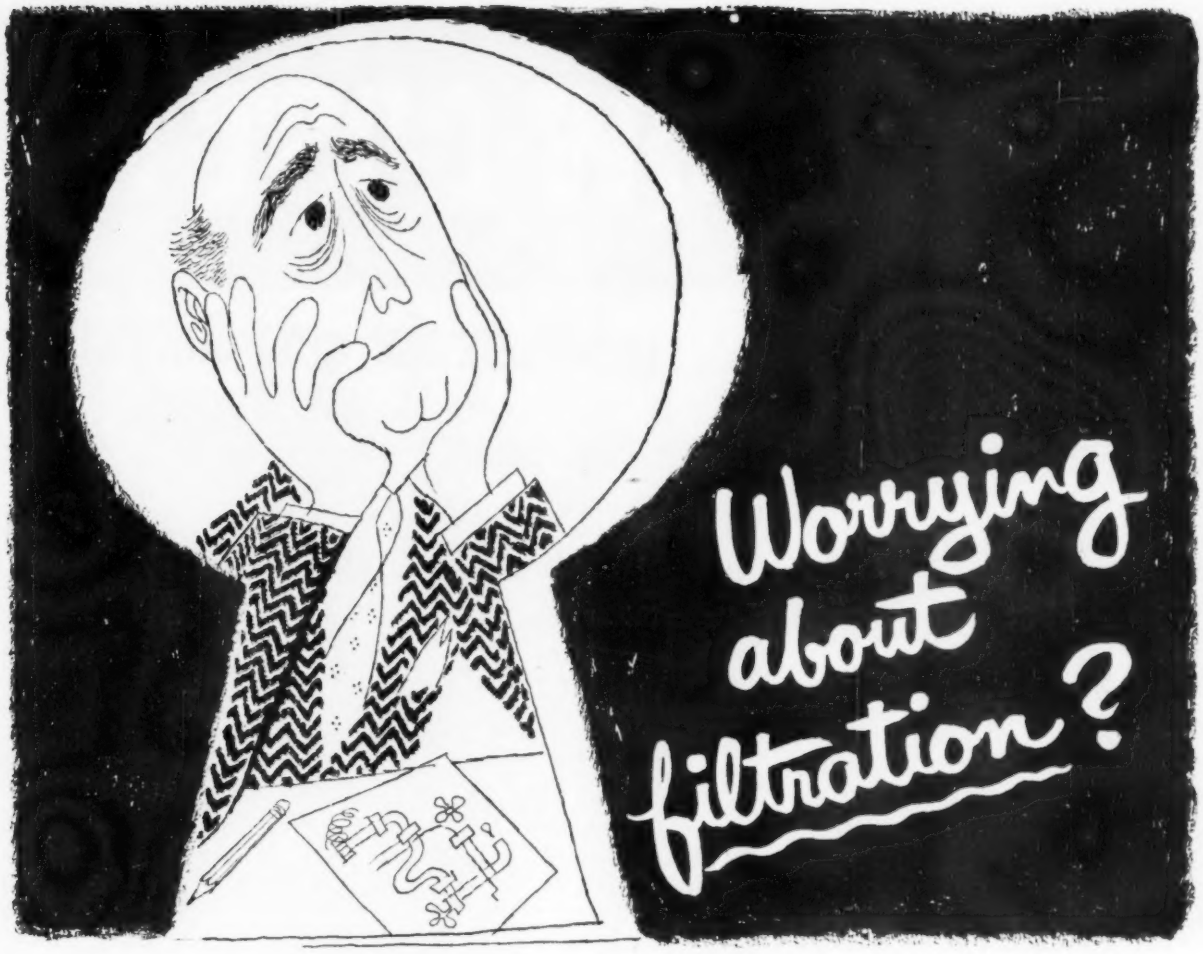
Manager Orville Hurford and Mr. Decker are justifiably proud of their 4-diesel engine generating station. The plant has been an outstanding financial success since the day it was first opened. Several times it has occupied #1 position on the REA Running Plant capacity chart.

Mr. Decker writes, "A large part of our operating success we attribute to Sinclair GASCON® D oil. It has given us an excellent rate of consumption while reducing wear. In fact, *cylinder and piston ring wear is much below normal based on other plants of equal capacity*. Something else we appreciate is the timely visits of the Sinclair Lubrication Engineers."

Top quality lubricants plus the assistance of Sinclair Lubrication Engineers are two of the reasons why Sinclair can play a large part in the success of *your* operation. Your local Sinclair Representative will be happy to explain the remaining reasons. Phone him or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

save Wear and Replacement



Purolator maintains the world's largest specialized filter research and engineering laboratories

. . . always ready to serve you!

Your filter problems—small or large—are always welcome at Purolator's Engineering Department.

If you find that none of the nearly one thousand types of standard Purolator* filters will fill the bill . . . we'll design one especially for you!

But before you decide on a custom-designed unit, you'll want to study the many kinds of Purolators available on order. The large, illustrated Purolator catalogs are yours for the asking. Just mail us the coupon, indicating which ones you wish.

Whether you need one special filter, or a million of a kind . . . your best source is *Purolator!*

*Reg. U. S. Pat. Off.

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey and Toronto, Ontario, Canada
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There's a PUROLATOR for every filter need

Lube oil	Air	Foods	Adhesives
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Purolator Products, Inc., Rahway, N. J.

Send the following Purolator catalogs:

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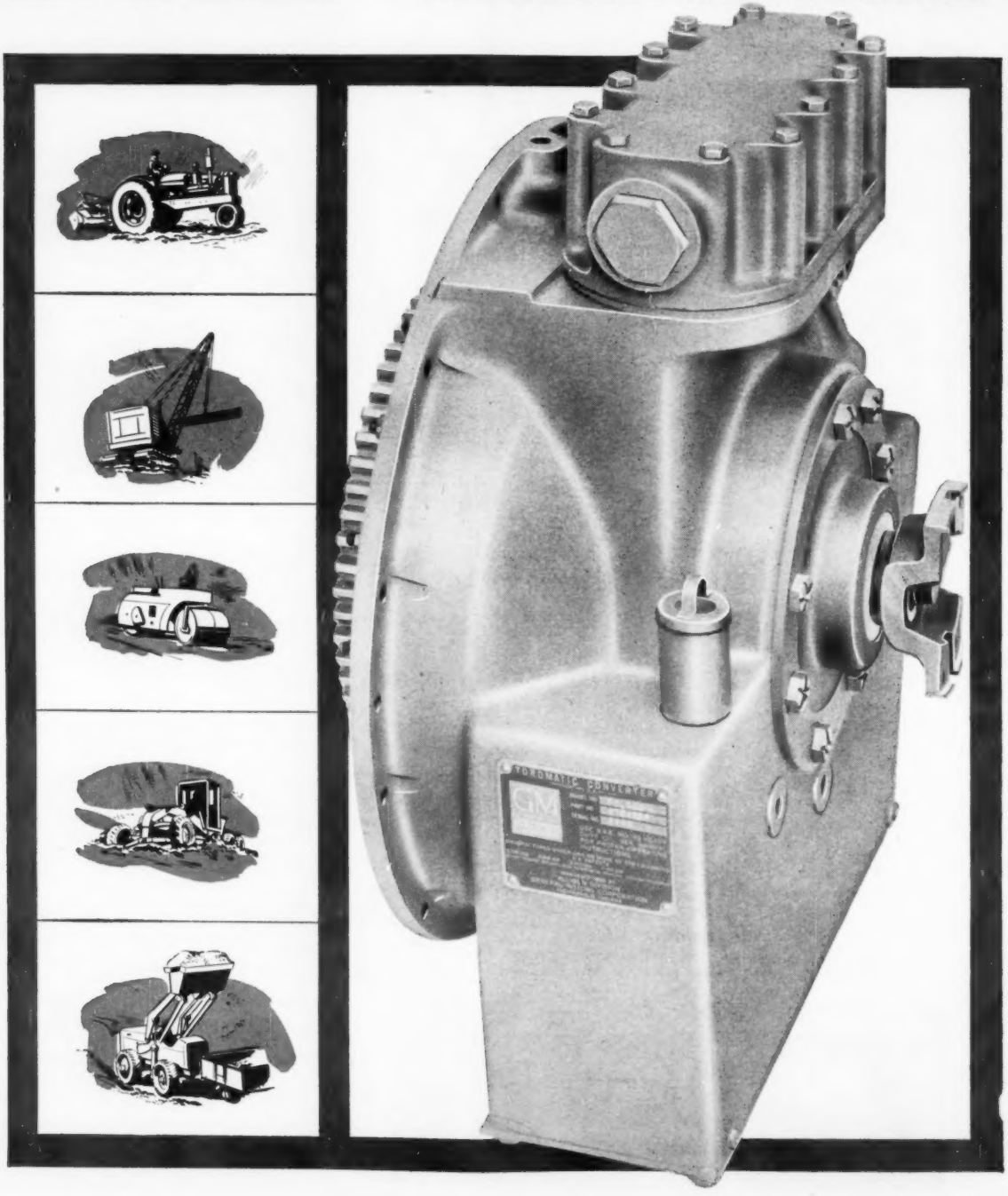
Company_____

Address_____

NOW LOW-COST HEA

EASY TO INSTALL **COMPLETELY SELF-CONTAINED**



VY-DUTY TORQMATIC CONVERTERS

For 40-150HP Gasoline- or Diesel-Powered Equipment

HERE, for the first time, are Allison TORQMATIC Converters designed for hard-working gasoline- or Diesel-powered equipment in the medium horsepower range.

These new torque converters are true heavy-duty units *priced to compete* with converters designed primarily for passenger cars—*priced to sell for less* than most comparable industrial-type converters.

And they fit your equipment with little or no change in your design.

Easy installation

New Allison TORQMATIC Converters are completely self-contained for simplified flexible installation—feature integral oil system including charging pump, oil cooler and oil sump. No outside oil lines required. Integral gear drive for easy mounting.

Standard SAE #3 mounting dimensions and conventional internal-external drive gear like that used in ordinary clutch power take-offs simplify installation.

Three different models give you a wide selection of torque ratio and capacity.

Options include front disconnect clutch and adapter, rear disconnect clutch adapter, standard flange as shown, industrial shaft with or without governor drive and oil cooler.

Why use a torque converter?

Your equipment lasts longer with an Allison TORQMATIC Converter transmitting power because it protects engines and driven equipment from harmful shock loads—one of the main causes of equipment breakdowns.

And you get more work from your units, too. New Allison TORQMATIC Converters multiply engine torque up to 3½ times and also provide more production because they broaden your engine's effective horsepower range. When torque output equals load demand the TORQMATIC Converter acts as a fluid coupling to conserve fuel and boost engine life.

Ask your engine or equipment manufacturer about Allison TORQMATIC Converters for your hard-working 40- to 150-horsepower units or mail the coupon.

GM GENERAL MOTORS

Allison

TORQMATIC DRIVES

Allison Division of General Motors
Box 894S, Indianapolis 6, Ind.

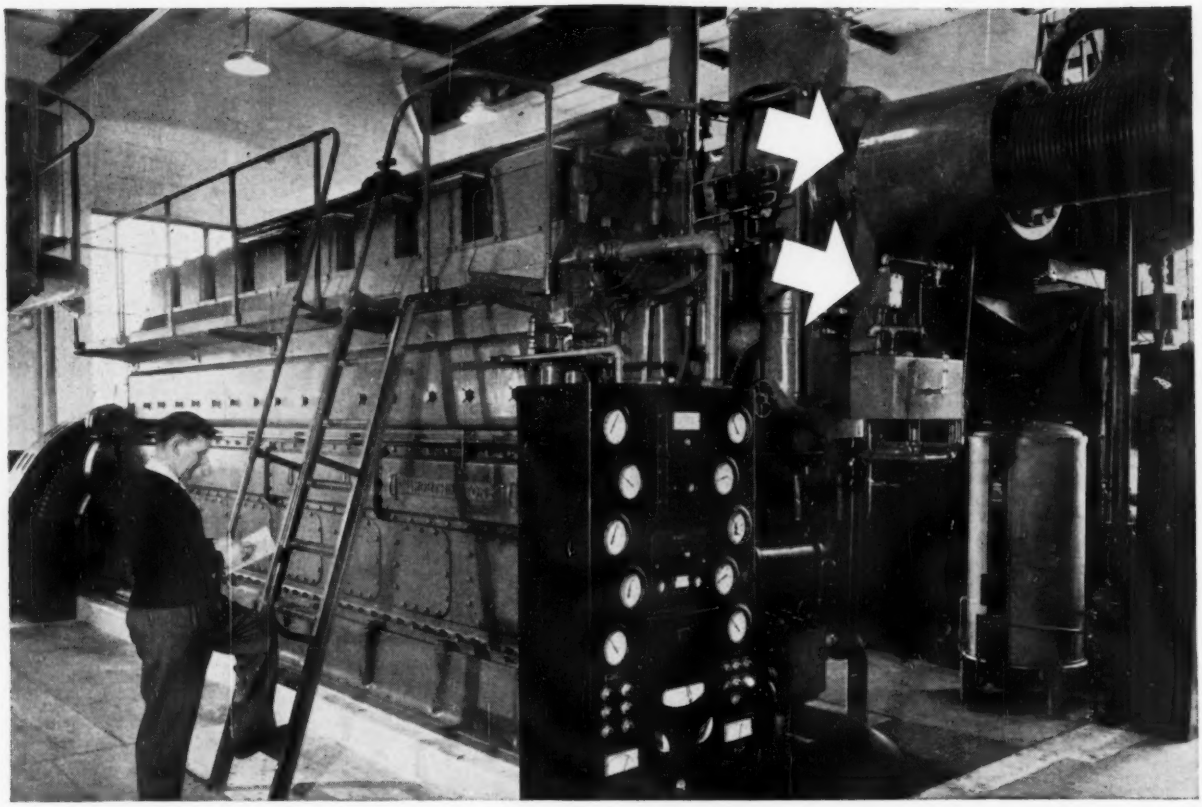
Please send me Bulletin SA 1031

Name_____

Position_____

Company_____

Address_____



Air-Maze in-line silencers muffle intake noise of Worthington diesels in municipal power plants

WORTHINGTON USES AIR-MAZE in-line silencers on the air intakes of their diesels in Waverly, Iowa and Le Sueur, Minnesota municipal power plants. The Minnesota installation is pictured above. These in-line silencers muffle intake noise when air is piped from a remote point.

Air-Maze in-line silencers reduce the noise level of the vibrating column of intake air to a point where it ceases to be objectionable. Other types of Air-Maze silencers help eliminate pressure waves—usually the most objectionable part of the noise, though not always the most apparent from instrument readings.

Where the noise problem is caused by vibrations of unusual frequency, an Air-Maze silencer can be built to handle your problem.

Mounted below the silencer is an Air-Maze oil separator. It removes the oil particles from the crankcase ventilating air but lets the air pass on through. Safer operation is insured.

With a background of twenty-nine years experience and thousands of applications, Air-Maze, the filter engineers, have met practically every diesel filtration and silencing need. Air-Maze serves the industry with a complete line of intake silencers, oil-bath filters, lube oil strainers, fuel filters, and other products. For help with your filter problems, contact your nearby Air-Maze representative or write The Air-Maze Corp., 25000 Miles Rd., Cleveland 28, Ohio.

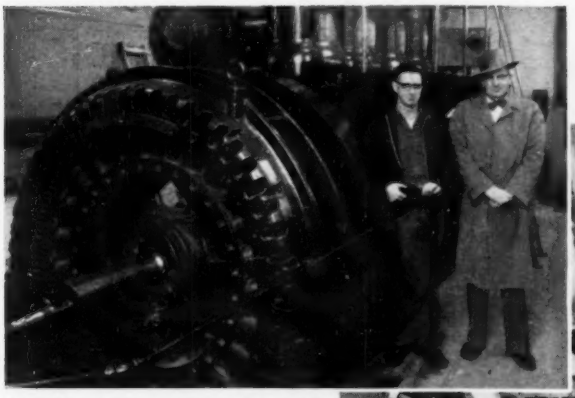
The biggest names in diesels are protected by Air-Maze filters

AIR FILTERS
SILENCERS
SPARK ARRESTERS

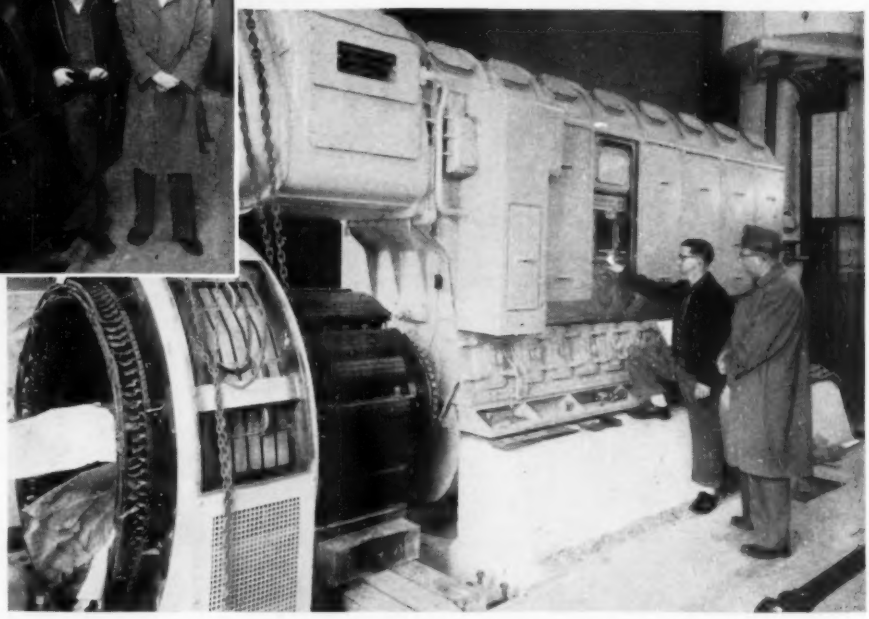
AIR-MAZE
The Filter Engineers

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

10 YEARS OF PURE-SURE OPERATION



(Above) Mr. Chester W. Willin, Chief Engineer of Seaford Power and Light Company, Seaford, Delaware, and Mr. W. B. Graham, Pure Oil Branch Manager, beside 4-cylinder Fairbanks-Morse Diesel engine which has been operating smoothly and economically on Pure diesel lubricants for the past ten years.



(Right) Chief Engineer Willin shows W. B. Graham why they have selected Pure diesel lubricants for this new 12-cylinder Diesel being installed at the Seaford Power and Light Company.

...so Seaford selects Pure Oil Diesel Lubricants for new 12-cylinder engine

This Delaware city has been using Pure Oil diesel lubricants for ten years. They know—along with many others—that Pure diesel lubes are the *sure* way to keep engines running smoother, longer and with greater economy.

Pure Oil makes a complete line of quality diesel lubricating oils including: Purodiesel series, Purodiesel XD series, Sultana X series, Sultana SHD series, and Klondyke series. Each is tailored to meet the needs of a particular set of operating conditions while insuring easy reclamation and long use life.

Your local Pure Oil diesel expert will be glad to help you select the right Pure Oil diesel lubricant for your particular unit and operating conditions.

FREE used oil analysis foretells engine trouble... saves costly repairs

Don't guess about the condition of the lubricating oil in your engine. A pint sample of used oil subjected to Pure's analysis system will permit our technicians to determine this and report to you any need for adjustments. To get this FREE Pure-sure Used Oil Analysis, send coupon today!

Offer must be limited to the area where Pure Oil products are sold.

BE SURE PURE WITH PURE

PURE OIL DIESEL LUBRICANTS

FREE BOOKLET

The Pure Oil Company, Dept. D-46
35 East Wacker Drive
Chicago 1, Illinois

Send me information on how I may obtain a Pure-Sure Analysis of my used diesel lubricating oil without cost or obligation.

Name_____
Position_____
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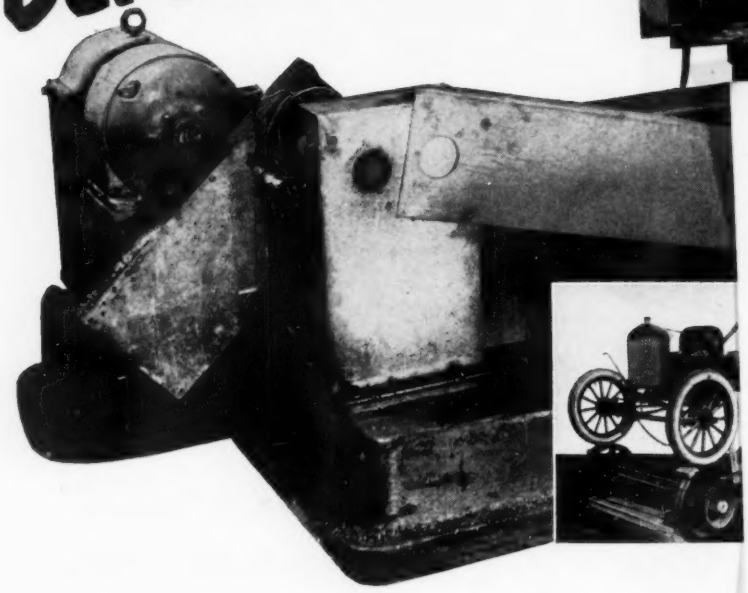
City_____ Zone_____ State_____

WE FIND WITH RADIATORS, TOO, IT PAYS TO SHAKE WELL BEFORE USING!



WA
PAC

Daily poundings from rough, broken terrain, high speeds, big
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been designed to take "in their stride" such torsional stress
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machines capable of duplicating the most rigorous conditions
with water, and pressure-capped at 8-10 psi, are vibrated up to
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Heating, Cooling, Air Conditioning Products for Home and Industry.

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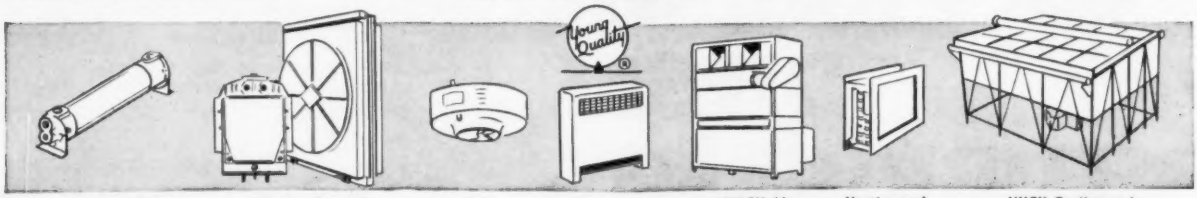

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DEUTZ
Diesel
1800 H.P. air- and water-cooled
for Road vehicles, Rail vehicles,
Watercraft, Working machines •
Marine engines also direct reversing
for all waterways • Diesel-trac-
tors 11 · 15 · 30 · 45 · 60
H.P. Diesel-locomoti-
ves • Generator sets
air- and water-cooled
for lighting current
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stationary and mobile
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WE FIND WITH RADIATORS, TOO, IT PAYS TO SHAKE WELL BEFORE USING!

Inset shows radiator shaking machine used early in the original development stages of engine cooling radiators by present Young engineers and executives. Modern vibration machines have assisted Young in developing the strongest Radiator structure known.

Daily poundings from rough, broken terrain, high speeds, big loads, and high and low temperatures are a few of the stresses and strains Young Radiators must withstand. Young Radiators have been designed to take "in their stride" such torsional stress and sudden shifts of mass. These unusually rugged, high-strength Radiators were developed, in part, from Young laboratory shaking machines capable of duplicating the most rigorous conditions imaginable. Test Radiators filled with water, and pressure-capped at 8-10 psi, are vibrated up to 1600 cycles per minute! From such tests have come Young-engineered vibration control mountings, restraining core side baffles, corner web reinforcing and many other stiffening structures that add extra life to the unit. Write today for further details on Young Radiators for improved heat transfer; there is no obligation.

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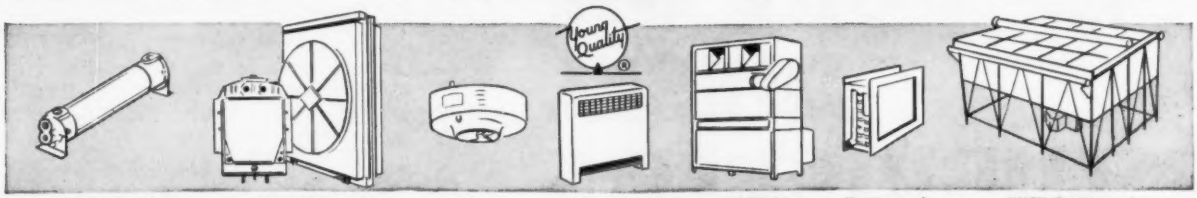

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Diesel
3-1800 H.P. air- and water-cooled
for Road vehicles, Rail vehicles,
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Marine engines also direct reversing
for all waterways • Diesel-tractors 11 · 15 · 30 · 45 · 60
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air- and water-cooled
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for greater efficiency-

S.S. JOHN D. McKEAN

New York's Newest Fire Boat

is powered by

ENTERPRISE

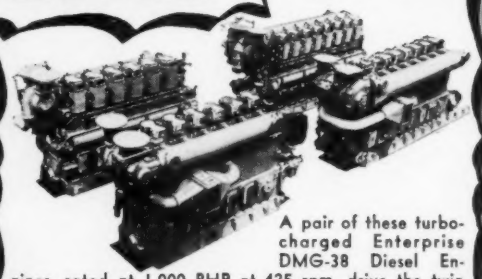
Diesel Engines

equipped with

BROWN BOVERI exhaust gas TURBO-CHARGERS

DEPENDABLE power plants — for propulsion and for operating its fire fighting equipment — are musts on the S.S. John D. McKean. Enterprise Diesel Engines equipped with Brown Boveri Turbo-Chargers — are aboard this unique fire boat.

More and more vessels are powered today by Enterprise Diesels. They operate more efficiently, more economically, with less maintenance. They have an extra power reserve for emergency overloads, a safety factor naval architects and ship builders recognize . . . ship captains appreciate.



A pair of these turbo-charged Enterprise DMG-38 Diesel Engines, rated at 1,000 BHP at 425 rpm, drive the twin propellers of this modern Fire Fighter, the S.S. John D. McKean. Two other Enterprise Diesels supply 1,000 BHP each at 600 rpm to operate water pumps capable of supplying 14,000 gallons per minute, 150 lbs. nozzle pressure. All four diesels equipped with Brown Boveri Turbo-Chargers.

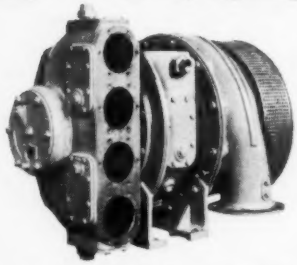
And, Brown Boveri Exhaust Gas Turbo-Chargers assure the greater operating efficiency and economy of these diesels.

It will pay you to get all the facts about these world - famous turbo - chargers. *Write for descriptive data today!*

advantages of

BROWN BOVERI exhaust gas TURBO-CHARGERS

- Continuous power increases of 100% or more.
- No increase in operating costs since chargers run on exhaust gases from turbines.
- 40% and more reduction in space and weight per HP of supercharged engine.
- Self-contained lubricating system eliminates special oil piping outside the engine.
- Ideal for use at high altitudes, too, since pressures can be increased to that of sea level operation.



A typical Brown Boveri exhaust gas Turbo-Charger. These are available in various sizes for charged outputs from about 100 BHP to 6,000 BHP, 4-or 2-cycle operation.

BROWN BOVERI CORPORATION

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Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Butte, Mont. • Chicago, Ill. • Cleveland, O. • Denver, Colo. Detroit, Mich. • High Point, N.C. • Jacksonville, Fla. • Kansas City, Mo. • Knoxville, Tenn. • Lewiston, Me. • Los Angeles, Cal. Minneapolis, Minn. • New Orleans, La. • New York, N. Y. • Portland, Ore. • San Francisco, Cal. • Seattle, Wash. • Tucson, Ariz.

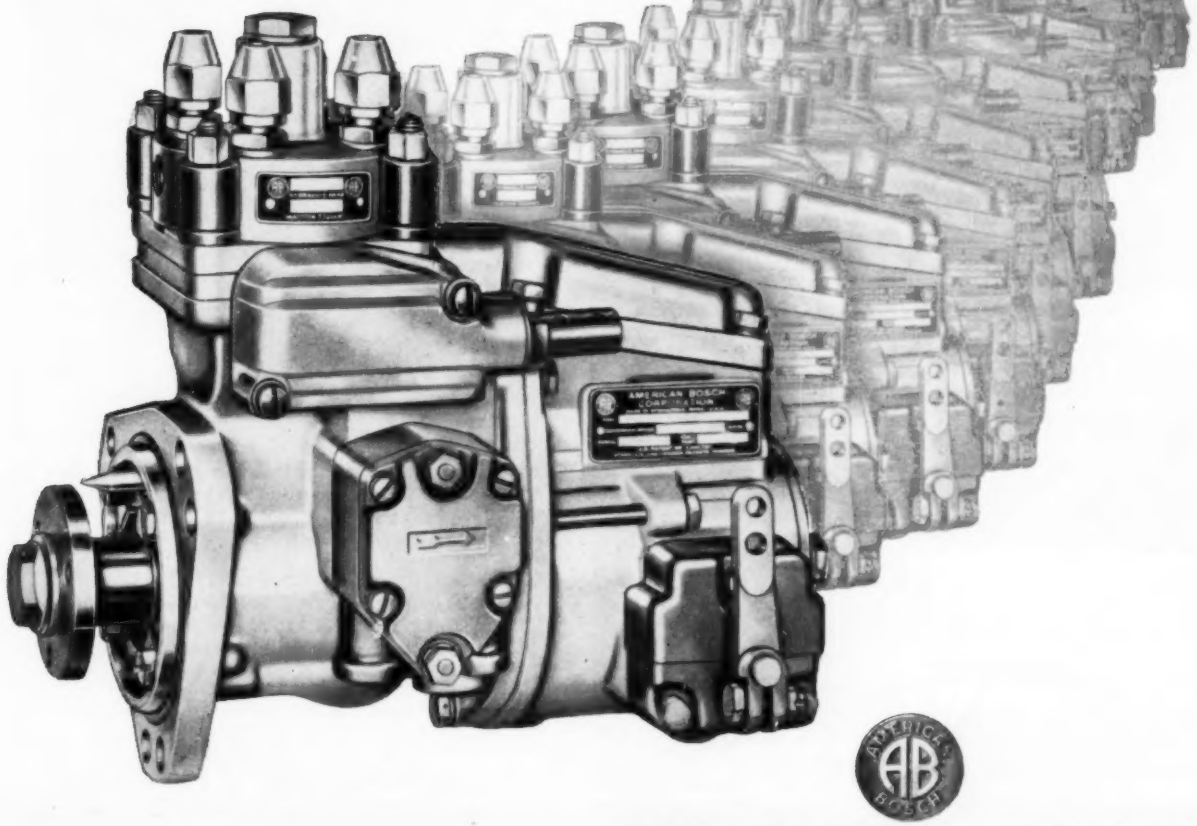
over 60,000 . . . and STILL GROWING

Over 60,000 American Bosch PSB single-plunger distributor-type Diesel fuel injection pumps have been produced since the pump was introduced several years ago.

Today, this simplified, lower-cost pump is being produced at a greater rate than ever before.

Here's definite proof of the acceptance of the PSB. It has literally revolutionized the concepts of fuel injection and made possible smaller, lower-cost Diesel engines . . . opening up new markets for Diesel power such as the farm tractor.

Tried and proved in the severest service, the PSB has rolled up remarkable records of performance—requires less maintenance—is easily serviced in the field. No wonder it has been hailed throughout the industry for its great contribution to Diesel progress.
American Bosch Corporation, Springfield 7, Mass.



2402

AMERICAN BOSCH

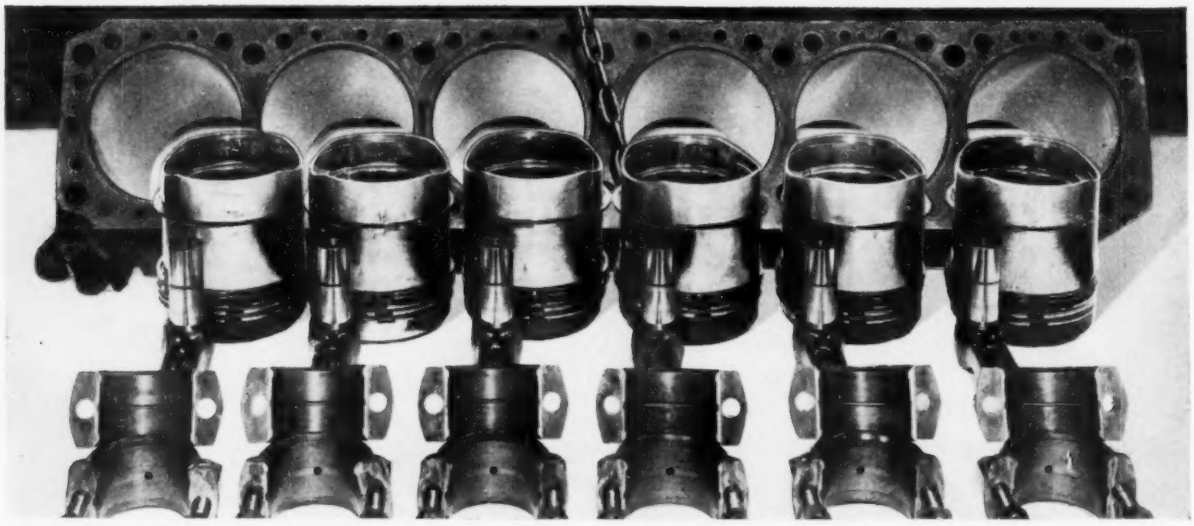
Standard Engineer's Report

CASE HISTORY

PRODUCT RPM Delo Oils

FIRM Osbourn Trucking Company, Los Angeles, Calif.

Only .0035" rod bearing wear after 960,042 miles!



THESE ORIGINAL BEARINGS, CONNECTING RODS, AND WRIST PINS from a 324-H.P. Hall-Scott engine are clean and in good condition after 960,042 miles! In running up this outstanding record on line hauls across the Mojave Desert to Las Vegas, the Osbourn Trucking Company, Los Angeles, used RPM DELO Special Lubricating Oil exclusively. It held wear down to only 0.0035" maximum on rod bearings, 0.0025" on mains and only 0.003" on the crankshaft. Also shown, the last set of rings and pistons used in the engine, went 321,468 miles. Note their cleanliness.

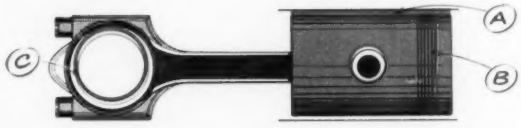
Ralph Hagopian, President of Osbourn Trucking Co., uses RPM DELO Special Lubricating Oil to cut maintenance costs on all of his trucks, which operate on propane and butane.

FREE FOLDER tells you about all the RPM DELO Oils and how they meet every heavy-duty engine condition. Write or ask for it today.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

How RPM DELO Oils reduce wear, corrosion, oxidation in all heavy-duty engines



A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

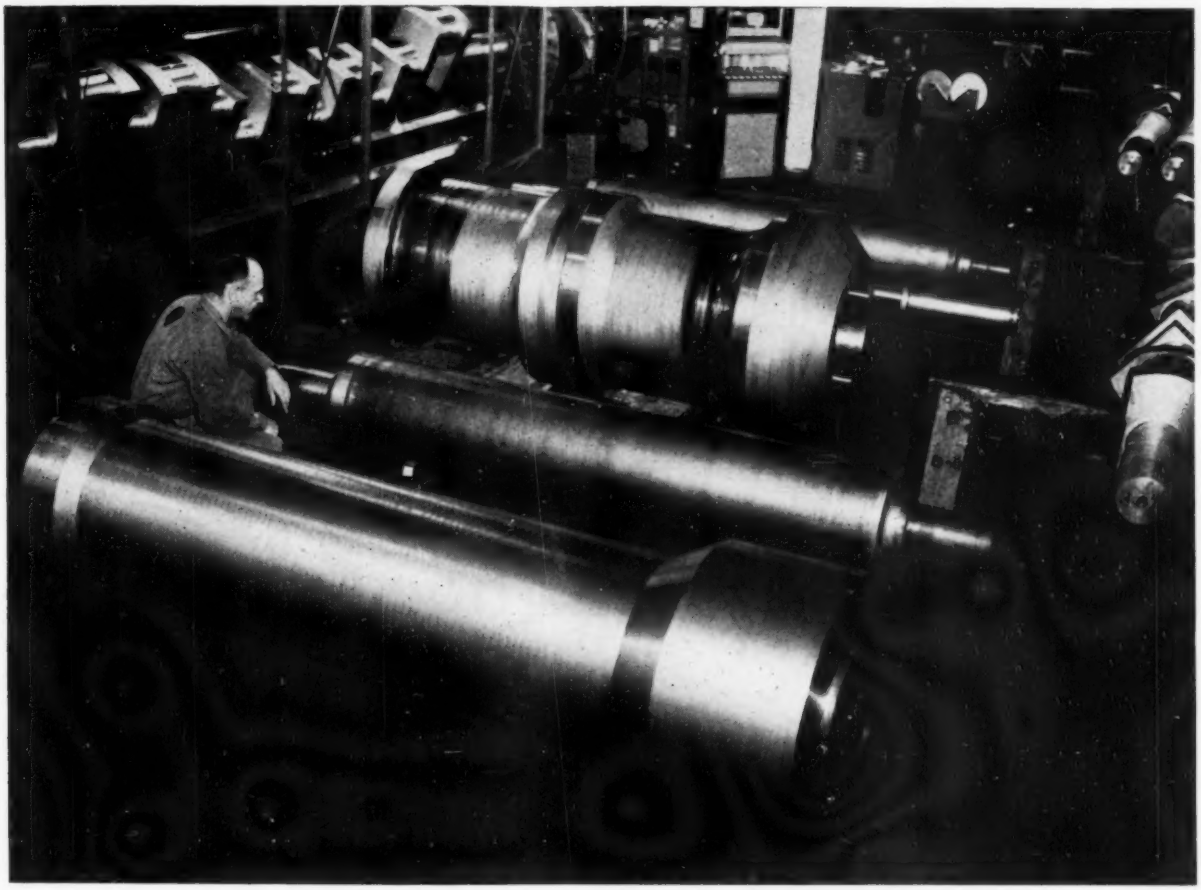
B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

Versatility at NATIONAL FORGE



Here is a ram, two flame-hardened rolls and a cylinder. In the left background is a crankshaft being machined.

This shows in a small part the large variety of forgings produced at National Forge. Small or large, alloy or carbon, heat-treated or annealed, rough or finished, each forged machine part is carefully produced to meet the customer's specification.

Besides a regular line of forgings, National Forge has additional facilities for contract machining and can produce single parts, sub-assemblies or complete machines.

This versatility offers you a service beyond the regular forge shop. Perhaps you have some problem in a forging or a machine component which might be solved at National Forge.

Write, wire, phone or visit us; we are always ready to be of service!

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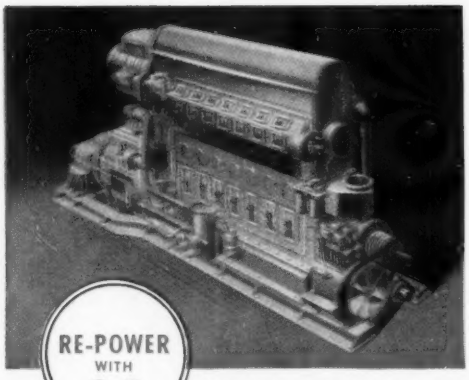
National Forge

AND ORDNANCE COMPANY

Irvine, Warren County, Pennsylvania

STEEL MAKERS ☆ FORGESMITHS
HEAT TREATERS ☆ MACHINISTS



Model 38F Marine O-P Diesel for the 225 to 750 horsepower class.

"He's spending more time at sea, that's why we see him less these days . . . and all because of something called Re-Powered with O-P."

Yes, there is a lot of talk on shore these days about those boats that have been re-powered with the newest in marine diesel power —the Fairbanks-Morse Opposed-Piston engine in the 225 to 750 horsepower class.

For this engine was specifically designed for putting more power, more speed and more performance in your engine space when you re-power. How? This engine is a *completely* packaged marine unit with all accessories . . . lube oil cooler, filters, pumps, heat exchanger and attendant piping engine mounted. Add to this the inherent compact design of the O-P engine that is 20% less in length and width . . . weighs about 20 pounds per horsepower . . . and you see why the new Model 38F offers you more power, more speed, more performance—in less space than with any other diesel engine.

There are more facts on the 38F that will be of great interest to you—low maintenance, reliability and economy. Call your nearby Fairbanks-Morse Marine Specialist—you'll be glad you did when *you* start spending more time at sea. Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY
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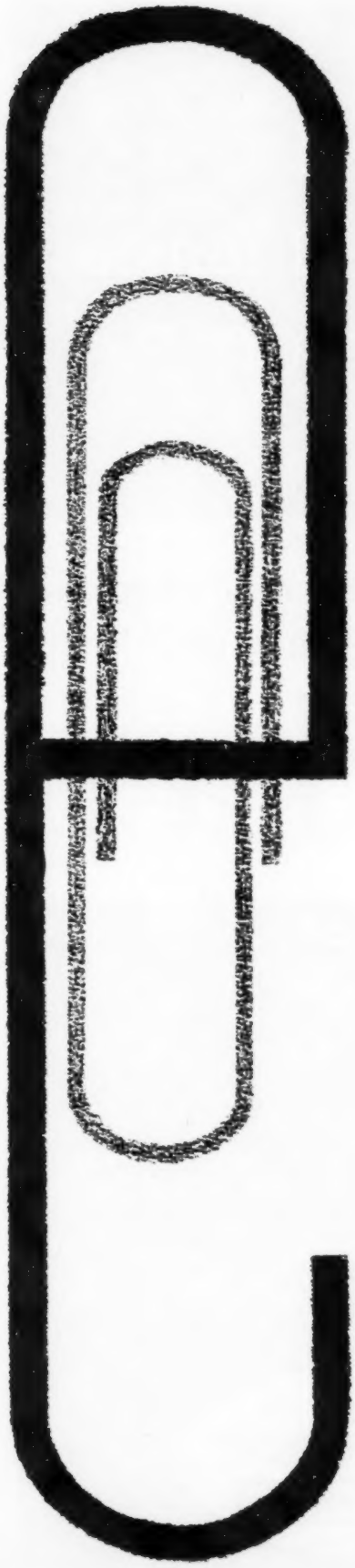
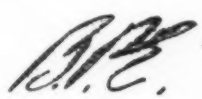


Boiinnnggg!

editorially speaking

It finally happened; ye Editor snapped his cap. It's that clipping service. Do you know that the country is knee-deep in nostalgia? And all for the old steam engine whistle that "gently echoed over the still countryside". Cows don't give milk; chickens won't lay eggs; and all because the steam whistle is gone. Every so often a moose will stand in the path of an onrushing diesel. The clippings do not make it clear whether it was lured by the mating call of the air horn or whether it was another clearcut case of nostalgia. Frankly, we're nostalgic for the days before all this nostalgia. Then there's the one about the fellow who wants all New York City buses to burn "bottled gas" to eliminate all irritating fumes. He never checked on costs or thought that cars, taxis, and trucks—all contributing "irritating fumes"—outnumber the buses by at least 20 to 1. Bus operators are straining to make ends meet through diesel economy, but they should change. Bet this fellow complains about present fares. Then there are the items about how Dr. Diesel didn't invent the diesel; H. Ackroyd-Stuart did it. The whole argument is academic because any fool knows the Russians invented it. The topper was one about a fellow in England who says that the increase in lung cancer "seemed to be tied to the inhaling of diesel engine exhausts." Smoked any good diesels lately? Seems that in Iceland where there are few diesels, the incidence of lung cancer is less than in Britain, although the people smoke as much. Maybe it's the British cigarettes. Wonder what's happening in the Antarctic where all the Penguins are busy smoking Kools? That did it. We'll go quietly.



Cyclan retains full tension up to 600° F.

No other piston ring material combines so many advantages as

Cyclan

- Cyclan is Sealed Power's new alloy for extreme operating conditions.
- Cyclan's strength approaches that of steel.
- Cyclan's resilience exceeds that of cast iron.
- Cyclan retains the bearing characteristics of cast iron.
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- Cyclan rings retain their true shape even after considerable deflection.
- Cyclan piston rings are especially durable in super-charged engines.
- Cyclan can be readily chrome-plated, but functions efficiently without plating.
- Cyclan is available for original equipment rings in heavy duty engines.
- Some Sealed Power Cyclan Ring Sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

highlights

- More than 54 billion gal of motor fuel were produced in the United States during 1953.

- Los Angeles, California will be the site of the Western Plant Maintenance Show. It will be at the Pan Pacific Auditorium from July 13 to 15, 1954.

- GM has begun construction of a number of new training centers for mechanics and dealers. When the program is completed, there will be 35 centers across the country.

- Since the Detroit Diesel Engine Division of GM began operation in 1938, engines totalling nearly 60 million horsepower have been produced. They power over 750 different types of industrial equipment alone, according to GM.

- "Oxycat", the new combustion catalyst is currently being used by the Sun Oil Company to burn carbon monoxide contained in catalytic cracking unit flue gases and to recover the heat released as steam, according to a recent API release.

- More than 25 million horsepower has been built in diesel engines by GM's Electro-Motive Division since 1934.

- AIEE will hold its Summer and Pacific General Meeting at the Biltmore hotel in Los Angeles from June 21 to 25, 1954.

- Canadian National Railways is planning the construction of approximately 320 miles of rail line in sparsely settled areas of Ontario and Quebec.

- On June 6, the Santa Fe Railway put another diesel-powered streamliner in service between Chicago, Ill. and San Francisco, Calif. It is called the San Francisco Chief and is equipped with the new full-length dome cars. The dome cars are also equipped with a diesel-electric set.

- Passenger service on the Jersey Central Railroad is now 100 per cent dieselized.

- It was estimated that well over half of the farm tractors supplied to the home market in Great Britain during 1953 were diesel-powered.

- Another Canadian pipeline is currently being planned. This one will be approximately 2240-mi in length, running from Alberts to eastern Canada. Estimated cost is in the neighborhood of $300 million.

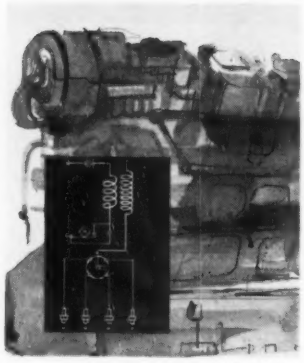
- Before summer rolls around, Greyhound will be operating its new luxury "Scenicruisers." These are deck-and-a-half buses which are said to be the last word in comfort. They will be powered by twin diesels.

- Roadway Express, Inc., recently purchased 124 new diesel-powered tractors from Mack Trucks, Inc. They were Model H-61T units, powered by Mack thermodyne diesel engines.

- It was recently reported that approximately 1092 miles of new toll roads are under construction. An additional 8361 miles are planned or authorized.

- Twenty trains of 100 tank cars each would be required to move the 440,000 bbl of oil which will be carried daily through the new 26-in West Texas Gulf system pipeline in Texas, according to API. In either case, though, diesels would do the moving.

- EMD has its seventh factory branch under construction at North Salt Lake City, Utah, adjacent to the Union Pacific Railroad. The branch will rebuild engines, generators and traction motors to factory specifications for railroads serving the northwest quarter of the nation. Rebuilt units will have the same guarantee that EMD gives new engines, generators, or traction motor.



Your engine is only as good as its ignition system. Following are some pointers necessary to the efficient operation of high-compression spark-ignition engines.

NOTES ON ELECTRIC IGNITION FOR HIGH-COMPRESSION ENGINES

By E. Frederick, Executive Engineer
Cooper-Bessemer Corporation

THESE notes are confined to the ignition systems and practices used on the larger and slower speed Cooper-Bessemer engines used for pumping oil, gas, and water in transmission lines, refineries, as well as driving generators where fuel gas is available and economical.

In the last six or seven years electric ignition for the heavy-duty type of gas engines employing compression pressures varying from 250 to 625 psi has undergone a lot of developments. The purpose was to increase its output over that required for low compression of 80 to 140 psi, and to improve its reliability and durability. A few chapters can be taken from automotive and aviation books; the whole book cannot be used.

With one exception (the pulse generator that will be described briefly later), there have been no radical changes in the various components and circuits composing battery or magneto ignition. To the casual observer the component parts give no indication of any difference between them and those of, say, ten years ago other than the usual style changes and models of different manufacturers.

Briefing Various Systems

It is more important on high-output ignition systems that all component parts are matched electrically. All electric jump-spark ignition systems employ a source of energy, interrupters, condensers, transformer coils (popularly known as the spark coil), and distributors—all wired to circuits that carry the high-tension current to the spark plug.

Neither high-tension magnetos nor high-tension distributors on battery systems, with one or two exceptions, are currently being used on these larger high-compression engines. This is due to the necessity of long secondary or high tension cables to the spark plugs which incur losses that give erratic performance. Figs. 1 and 2 show the schematic circuit of these two systems, respectively, for a 4-cyl engine.

Figs. 3 and 4 show the schematic circuit of low-tension magneto and battery interrupter systems, respectively. With either of these two systems the primary or low-tension current is distributed to a separate spark or transformer coil at each cylinder, located as close to the spark plugs as practical. This reduces corona losses of the high-tension cable to a minimum and insures more uniformity of spark plug life and operation.

Fig. 5 shows a modification of Fig. 4 which uses a single interrupter and condenser with a low-tension distributor to the various cylinders. This has several advantages over Fig. 4, the first being that any wear on the single interrupter cam follower and points changes the spark timing to all cylinders the same amount. It removes all burning of distributor points or contacts since they open and close when no current is flowing; the only deterioration is purely mechanical and is practically nil. Use of one condenser removes the variation between condensers that can occur in systems shown in Fig. 4. It simplifies the renewal of interrupter points as there is only one set against one per cylinder on the other system.

Fig. 5A shows a Cooper-Bessemer Corp. radial single-point interrupter with low-tension distributor.

The "pulse generator" is a super-generator that does not depend on brakers or interrupters for timing, or to cause a sufficiently rapid reversal of flux and current to generate enough voltage in the secondary winding to

jump the spark plug gap in the engine combustion chamber. This pulse generator, like magnetos, can be obtained either in high-or low-tension versions. A brief description of the low-tension version with twin or two spark plugs per cylinder will be given. A schematic sketch is shown in Fig. 6 and a sectioned view in Fig. 7 of an American Bosch Pulse Generator type MGC.

It will be noted that an interrupter and condenser are shown in the circuit for each cylinder like in a conventional battery system. These are put in operation and used only in starting, as impulse couplings are not employed to get sufficient magneto speed to generate a sparking current.

Normally all these interrupters are open and are brought into operation automatically by a small pneumatic cylinder when starting air is admitted to the engine. The pulse generator then functions like a conventional magneto. The breakers are usually timed to retard the spark 4 deg. to avoid high cylinder pressures while the engine is rotating slowly. As soon as the engine commences to fire, starting air is shut off and the breakers are put out of operation with all interrupter contacts open. An electric solenoid can be employed to perform this function, if desired, instead of air.

Due to the design of the magnetic circuit and the generator coil windings, a comparatively slow movement of rotor produces current with a steep wave front which, if connected to a transformer coil, will generate voltage enough to jump the spark plug gap. Due to one flux buildup, one flux reversal, and one flux decay every time the magnetic rotor sweeps a generating coil, an alternating current is produced in it, as well as the primary and secondary windings of the spark coil. This causes three sparks per generating cycle.

This would rapidly errode the spark plug points and cause a timing "wander" (that is, timing is not precise from one firing cycle to the next). To overcome this, a half-wave rectifier is put in the primary circuit of each

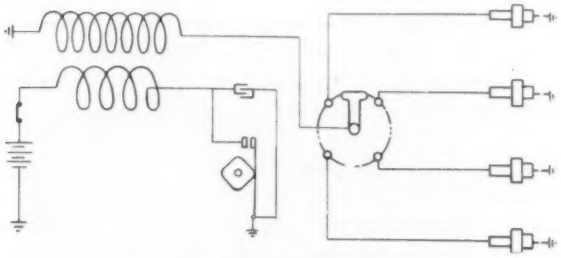


Fig. 1 High-tension magneto circuit.

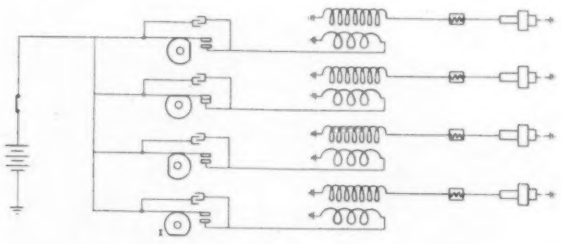


Fig. 4 Low-tension battery distributor circuit.

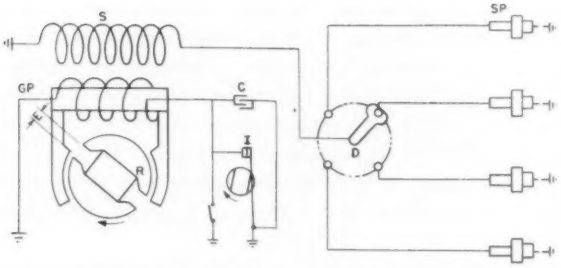


Fig. 2 High-tension battery distributor circuit.

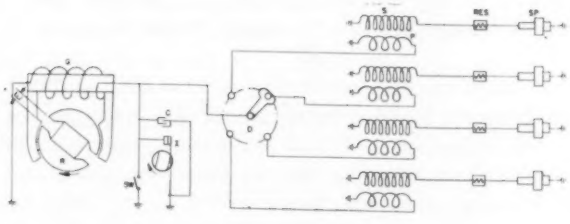


Fig. 3 Low-tension magneto circuit.

spark coil. This rectifier eliminates the first and third spark using only the second, which is the strongest (due to flux reversal), and keeps sparks unidirectional for all cylinders. This feature requires that primary leads to the coil must be reversed if it is desired to reverse rotation of generator.

Spark or transformer coils can be obtained that will fire two spark plugs per cylinder simultaneously when desired. This is accomplished by bringing both ends of secondary windings out and connecting each to a spark plug, putting them in series. This is shown in Fig. 6. Removing a cable from one plug will cause both to miss. Grounding one plug doubles the voltage available for the other.

We considered this the first self-generating ignition system that was adequate for "diesel" compressions. Since that time both American Bosch and Bendix Scintilla have developed conventional low-tension magneto systems that will do the job. Fig. 8 shows a sectioned view of a low-tension Bendix Scintilla Type LC magneto which has an improved method of changing the point of ignition timing without changing the "E" gap; that is, the relation between the rotor and field poles with respect to opening of breaker points. This is a desirable feature

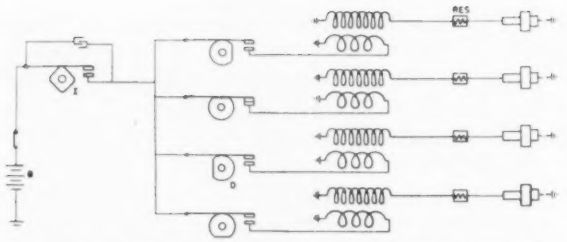


Fig. 5 Low tension battery distributor with single interrupter.

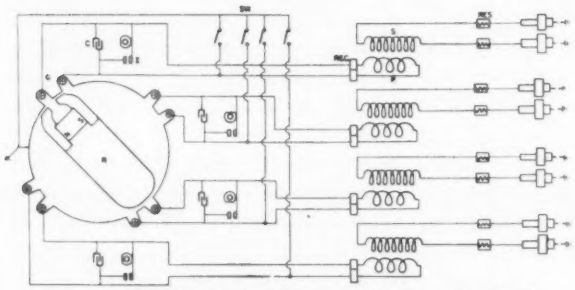


Fig. 6 Low-tension Bosch pulse generator twin-spark circuit.

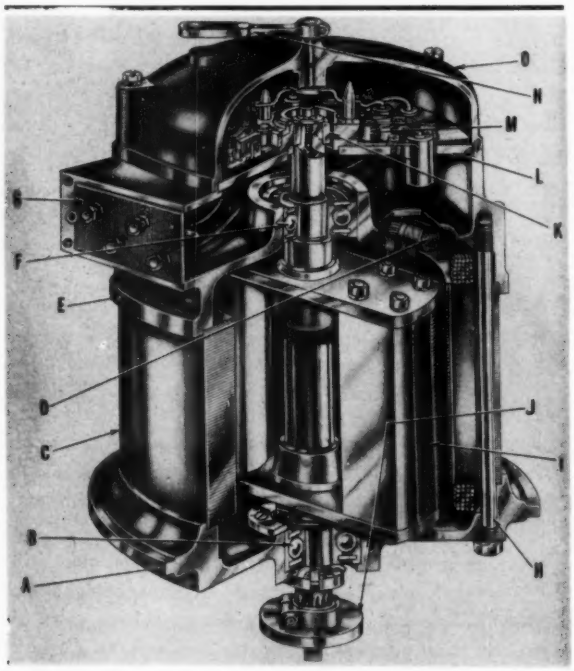


Fig. 7 Bosch pulse generator type MGC

A—Mounting flange
B—Lower bearing
C—Stator
D—Primary generating coils
E—Top-end plate
F—Top bearing
G—Insulated terminal plate
H—Stud
I—Rotor, Alnico magnet & pole shoes
J—Drive coupling
K—Interrupter starting cam
L—Starting breaker plate
M—Breaker assembly with condenser
N—Starting breaker engaging lever
O—End cover

for some types of engines that have automatic spark control.

This is accomplished by rotating the field poles with the generator windings and frame (to which the breaker is mounted) around the rotor. The correct "E" gap is very important on any magneto, especially on high-compression engines, and is frequently neglected when installing new points. It should be checked (see Fig. 3). All conventional magnetos, if they have variable timing, should be in the fully advanced position when timing to the engine. Magneto should always be run in full advanced position, otherwise breaker points will arc more, especially if high output is needed to fire fouled or wide-gap spark plugs. On the LC type magneto this is not necessary as "E" gap and breaker opening remain fixed regardless of advanced or retarded timing.

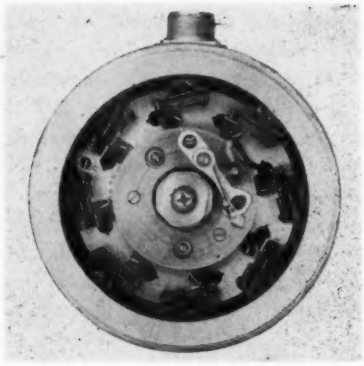


Fig. 5A Cooper-Bessemer radial distributor with single interrupter.

External Energy Sources

Returning to systems using outside energy; namely, a 12-volt DC current supplied by a battery (charged through an AC rectifier) and rectifiers without battery, Figs. 9, 10, 11 & 12 show four ways of doing this. There are various other combinations that can be used.

Fig. 9 is, we believe, the most desirable and possibly represents the highest investment cost as a battery which "floats" on the line is installed. This has three advantages: First, each engine has its own independent battery system; secondly and important, the engine will continue to operate if the AC supply is interrupted, the length of time depending on current consumption rate and size of battery; and third, that voltage to engine is uniformly steady.

Fig. 12 is the least desirable and also might cost less, but it does require heavy DC buses to reduce voltage drop from one end of station to the other. The amount depends on length of station. Fuses, or protective device should be installed in each engine circuit as shown at "F".

Polarity reversing switches installed in the DC circuit are preferred by some stations, especially if the ignition system is not balanced and interrupter points tend to arc too much. Reversing polarity three times a day distributes burning to both points instead of it all being on one. Grounding the negative side reduces the available secondary voltage but a system should be capable of operating on this reduced voltage; otherwise, the system is inadequate. Fig. 10 shows such a switch as "Rvr. Sw."

Three-phase rectifiers when used without a battery must be capable of withstanding a "kick-back" current of 300 to 400 volts which occurs when the primary interrupter or breaker opens. If the AC supply voltage varies, it is desirable to be able to restore the voltage which in turn would restore or vary the DC voltage to a point where best operation with minimum arcing of breaker points is possible. Fig. 12 shows the "Variac" installed in AC supply. This can change the voltage from 0 percent to 110 percent. Such a manually-operated instrument is made by the General Radio Co., Cambridge, Mass.

DC voltage of a three-phase rectifier is almost as steady and uniform as from a battery. One-and-two-phase rectifiers can be used only when a battery "floats" on the line to iron out the voltage variations.

Rectifiers without battery should preferably be on an AC circuit that is not subjected to voltage drops such as

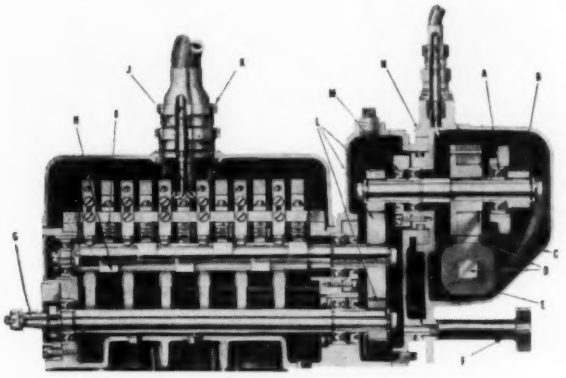


Fig. 8 Bendix-Scintilla type LC magneto

A—Rotor shaft ball bearing
B—Cam; breaker and cond. not shown
C—Rotor with permanent magnets
D—Field pole pieces
E—Generator coil
F—Lock-nut for changing timing
G—Engine-driven shaft
*H—*Distributor cam*
*I—*Distributor contactor*
*J—*Scinflex pin connector*
K—Union nut, Scinflex connector
L—Distributor & rotor drive gears
M—Grease seal
N—Movable housing for timing
**One per spark plug*

occasioned by starting up large motors. Sometimes this drop can be low and long enough to cause shutdowns on one or all engines on the circuit. If the AC current is supplied by a high line, lightning and thunderstorms can and have caused momentary drops in voltage sufficient to shut down engines on this service.

Transformers and Condensers

Transformer or spark coils should be located as close to spark plugs as practical to reduce length of secondary or spark plug cable. They should be well grounded to the engine. Coils should not be located in excessive heat, but they should be able to stand an ambient temperature of about 175° F.

Some types can be mounted in any position, while others are limited due to venting, type of insulating filler, and location of different coil components. A good rule is to mount them vertically with terminals on top side; if this is not convenient or practical, check with the manufacturer, or determine by test.

Spark coils are wound to give 50 to 100 percent more voltage than that required for low-compression engines. Due to slower engine speed they take more time to fully saturate. The average auto engine ignition systems would overheat the coils if operated at these low speeds, unless the interrupter was changed to a shorter cam dwell or contact period.

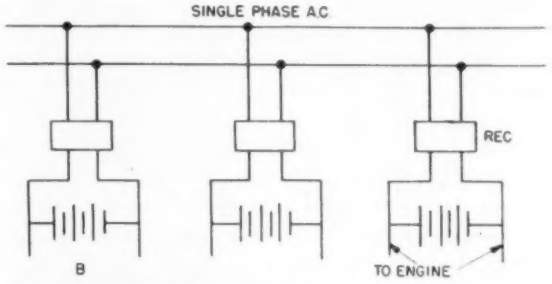


Fig. 9 Individual battery system with single-phase AC rectifying charger.

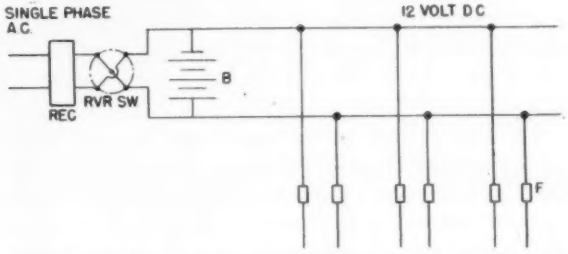


Fig. 10 Single battery bus with single-phase AC rectifying charger.

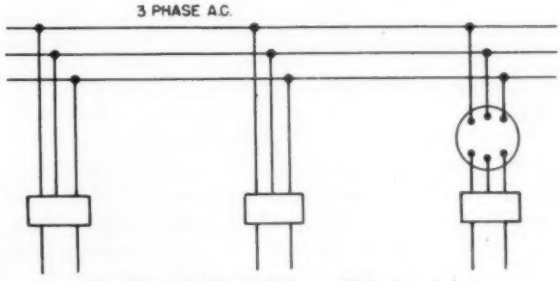
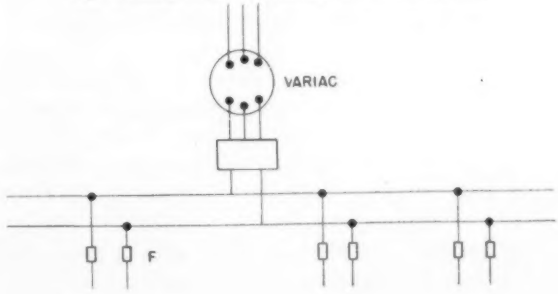


Fig. 11 Individual 3-phase rectifiers per engine.

Fig. 12 Single 3-phase rectifiers on DC bus system.



Coils used on battery systems generate their sparking voltage when the primary current collapses at interrupter points opening. The reverse is true when used with a low-tension magneto as the sparking voltage occurs on a rising primary current when the interrupter points open and surge the generator current into coil.

Condensers, next in importance to being of correct size or capacity, should be ruggedly constructed, this is particularly true of the point where the terminal fastens to the sheet foil. They should also be moistureproof.

Interrupters and Breakers

Much depends on interrupter or breaker points in either a battery or magneto ignition system. These points are made of various alloys ranging up to pure platinum. Tungsten is a very satisfactory and popular material that is reasonably priced.

Points perform better if both contact surfaces are flat, well polished, and line up to contact each other close to 100 percent. They should be securely fastened (by one of several methods) to the arms and posts by factory riveting, by screw threads, or preferably by welding or brazing. Hand-riveting should be avoided unless necessary skill and tools are available.

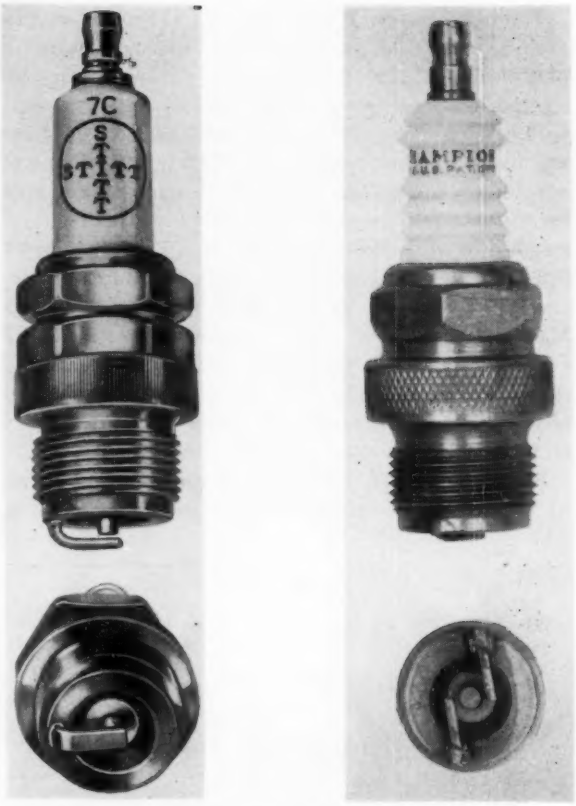
Points placed on ordinary anvils for riveting become contaminated and contact surfaces ruined by picking up dirt or metallic particles which cause arcing and burning of them. Dust and oil vapors also cause arcing and burning.

Platinum, in spite of the higher cost, is preferred by some manufacturers and operators. Platinum points are often used on new systems to help determine the right size of condenser across them. With correctly matched components, clean contact surfaces, and correct condenser size, no arcing will occur.

If tungsten contacts are then substituted and they arc, it is pretty certain that the contact surfaces are contaminated and will pit and turn black. If only slightly contaminated, they may cease arcing after a few hours operation.

Any "needle points and pits" that may form should *not* be removed, either by file or oil-stone, as they are not fatal and may even remove themselves after a few hours of operation if the system is balanced. The "open" gap can be checked by using a clean "feeler" gauge alongside the "needle". Most gaps are around 0.015-in and should be kept close to this or the gap recommended by the manufacturer. If operated with excessively wide or close gaps they will arc and soon burn themselves to the point of uselessness.

Contact surfaces of healthy points are velvety gray in color. Platinum points, when contaminated, maladjusted, or unbalanced, may burn but they do not develop "needle points" like tungsten alloy points. Platinum points that lose half of their contact surface due to abuse can still be used without resurfacing after the cause of arcing has been corrected. Tungsten points cannot, due to their high resistance.



Figs. 13 & 14—For different applications, spark plugs vary as to threads, reach (threaded section), heat range, and type as well as number of electrodes. The Stitt 7C at left is a 7/8-18 plug with a standard reach (5/8-in) in the cold range, having a single J-wire electrode. The Champion 901-A2 with similar characteristics, features two ground points.

After new interrupter points and cam followers have been installed and adjusted for correct timing and opening they should be operated for 48 to 72 hours and then checked for opening and, if necessary, readjusted to correct for initial wear. Wear is usually rapid for the first few hours after which contacts will only need checking at the usual established service periods. A 10-min shutdown for this service check and adjustment pays big dividends.

Spark Plugs and Gaskets

Spark plugs for high-compression engines with their higher firing pressures have undergone evolutionary changes that are apparent only to the discerning eye or when specifically pointed out. Needless to say the mechanical strength of both the insulating material and metallic shall have been increased. Also, better and stronger seals are used between the center electrod, and insulator, as well as the shell. Due to the higher voltage necessary, the insulating path from plug terminal to shell has been lengthened either by convolutions (concentric symmetrical wrinkles similar to those used on high-line insulators) or by increasing the length of the insulator.

This has been found necessary not only to withstand the higher pressures and voltages but also the high torques required for proper seating of the plug in the cylinder head. A torque of 70 to 80 ft lb is specified on 7/8 in x 18 thread plugs, or two to three times as much as used on low-compression or automotive-type engines.

Spark plug threads should be well machined, correctly sized, and gasket seat should be smooth and at right angles to the plug axis. This specification also applies to the hole into which it fits.

Spark-plug electrodes or points vary from a single type ground to as high as four ground points. See Figs. 13, 14, 15 and 16 which are a Stitt 7C (single J-type point); a Champion 901-A2; a Stitt No. 147; and Champion No. 901-X3, respectively. These companies helped in our development and will furnish the four general types shown and others.

The J-type point tends to straighten out when hot and increase the spark gap; the thicker the J-point cross-section, the greater the increase. This is taken care of in practice by initially setting the normal gap of 0.015 in closer—say, 0.012 or 0.013 in. Some engines operating for long periods at light loads may do better if spark-plug points are gapped at 0.020 in.

Square and sharp edges of the eelctrodes require less voltage than when the edges are erroded to a round shape. Platinum points are usually smaller in cross-section than other alloys and, of course, cost more. Some operators justify this extra first cost as less expensive in the long run.

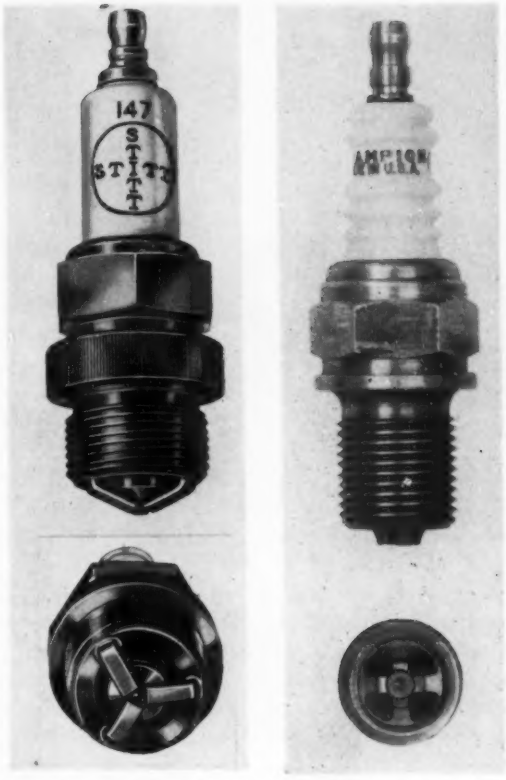
Spark-plug gasket specifications call for solid copper, annealed dead soft, 0.075 to 0.100-in thick. The ID should be a neat fit on outside diameter of threads with the OD of the gasket a loose fit in the head's shallow counterbore.

Thin folded gaskets or copper asbestos gaskets are unsuitable for the heavy seating torque required on these spark plugs. They start leaking very soon and do not transfer heat from plug to water jacket as well, resulting in burned threads that are damaged or destroyed when attempting to remove the plug. Spark plug gaskets should not be used a second time but should be discarded and replaced by new ones.

New gaskets reduce risk of leaks and are cheaper than the time required to replace them. Copper gaskets work-harden when squeezed by the plug. They are also apt to score and tear during plug installation or removal, thus making it difficult to get a tight joint the second time. Possibly, some gaskets do not score or tear and could be salvaged by proper annealing but unless there are large quantities of them with proper facilities and skill available it is not worth the effort.

High-Tension Wiring

Where long high-tension leads or cables were employed it was found that high-resistance stainless steel wire was preferable to copper due to less capacitance or condenser effect. A single coating of insulating material



Figs. 15 & 16—Stitt's 147, at left, is similar to those on the opposite page with the exception that considerably more metal is used in the center electrode and the three ground points. Champion's 901-X3 has a longer reach and four ground points. Sparking occurs at the ground point with minimum gap (least resistance). As gap widens in use, sparking moves to another ground point.

was also desirable for the same reason. The problem was to obtain an insulating material high in dielectric strength, with a minimum of capacitance and ability to maintain these properties in a temperature of about 250° F that might be encountered at the spark plug end of the cable. This was particularly important on shielded or low fire-hazard systems.

The first automotive type of insulation dried hard and developed minute cracks in a few days which, of course, leaked current to the ground and eventually ceased firing the plug. Numerous silicon insulated cables with various types of braided covers have been developed and tried; while they stand heat well, mechanical strength is low and capacitance high.

Teflon-insulated cable as made by the Boston Insulated Wire Company is wrapped with thin and narrow Teflon strips which are retained in place by a braided glass covering. This can be used in excessively hot places and still retain its dielectric and mechanical strength although it will not stand oil or oil vapors too well. In the future it will no doubt be moulded onto the wire (which we understand is a problem) the same as other insulators. This should improve and reduce its cost (we hope) and its capacitance and, therefore, make

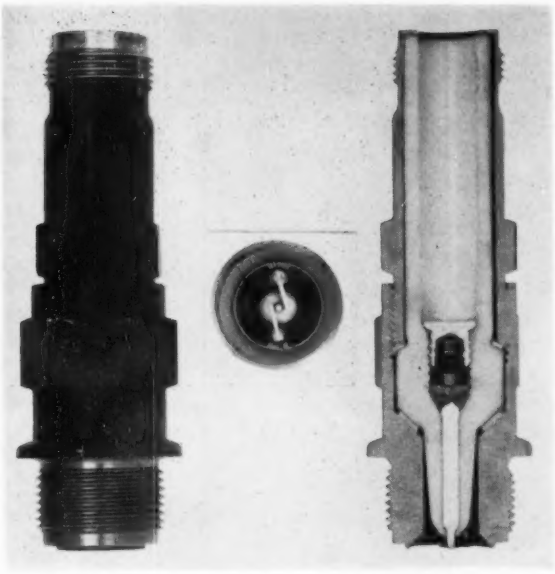


Fig. 17 Three views of the BG type RB842S with 2-in flash-over shield (upper left).

Fig. 18 (upper right) Bosch oscillogram of secondary current across plug gap with resistor.

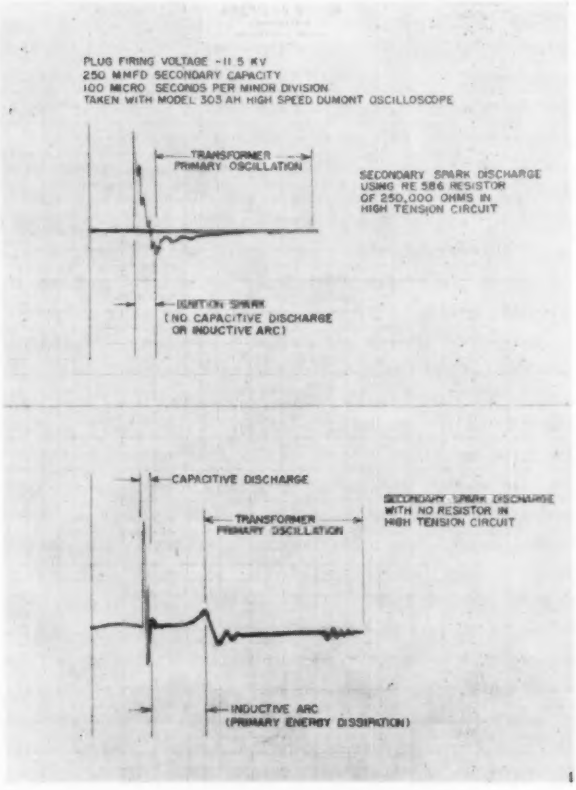
Fig. 19 (lower right) same thing as Fig. 18, but without resistor.

Fig. 20 Bosch RE586-2 resistor on plug (left).

sulated copper-stranded wire and keep away from excessive heat if possible. If higher than normal temperature is encountered, silicone or asbestos insulation can be used. Mostly all silicon insulation stands the heat but only a few types can stand the mechanical wear and tear and, therefore, it should be installed with extreme care and be protected in conduit when it is required.

Some types of plastic insulation stand higher than normal heat and lots of mechanical punishment. Several layers of different insulation can be used with no ill effects.

Terminals should be securely fastened to wire by solder or other approved means. The No. 16 gauge, American or Brown & Sharp, is a good size for 12-volt ignition systems. Slightly larger or smaller sizes can be used if required, but the important point is to stick to one


PLUG FIRING VOLTAGE -11.5 KV
250 MMFD SECONDARY CAPACITY
100 MICRO SECONDS PER MINOR DIVISION
TAKEN WITH MODEL 303 AH HIGH SPEED DUMONT OSCILLOSCOPE
TRANSFORMER PRIMARY OSCILLATION
SECONDARY SPARK DISCHARGE USING RE 586 RESISTOR OF 250,000 OHMS IN HIGH TENSION CIRCUIT
IGNITION SPARK (NO CAPACITIVE DISCHARGE OR INDUCTIVE ARC)
CAPACITIVE DISCHARGE
TRANSFORMER PRIMARY OSCILLATION
SECONDARY SPARK DISCHARGE WITH NO RESISTOR IN HIGH TENSION CIRCUIT
INDUCTIVE ARC (PRIMARY ENERGY DISSIPATION)

it more desirable for radio or low fire-hazard shielding.

A plastic-insulated wire developed by Packard Electric Co. (Div. of GM) has shown a marked improvement in performance and life in oily locations. These conditions are usually encountered on engines with mechanically-operated valves.

The same type and size of cables should be used on all cylinders of a given engine for the best results.

Primary Wiring

For satisfactory primary wiring, use a suitable, insize and not change after the complete system has been matched and balanced.

Special Installions

Low fire-hazard or radio-shielded ignition is more expensive to buy and maintain; it requires more meticulously clean and close maintenance and anywhere from 25 to 50 per cent more voltage. When required, the high-tension wire is furnished with a braided metallic (stainless steel is preferred; next, copper) covering that is grounded to the coil case at one end and to the plug

ground at the other. Primary wire is also shielded and grounded.

Low fire-hazard or shielded plugs have increased their "flash-over" (length of insulator) from the one inch aviation standard to two inches. Fig. 17 shows a BG #RB842S plug intact and sectioned, respectively. Champion also furnishes this type of plug as No. 1100-1.

The insulated well on the plug's terminal side should be cleaned with alcohol or acetone to remove all traces of grease or oil which are fatal to good operation after a plug is heated up. This also applies to any extension sticks, if used. To reduce fire hazard from interrupter points, low-pressure air of ½ in to 1 in of water can be put through a chemical dryer and then introduced into interrupter case thus keeping any explosive gas or vapors from the contact points.

Resistors

Fig. 20 shows a Bosch #RE586-2 external resistor of 250,000 to 400,000 ohms used in the secondary or high-tension circuit and mounted directly on the spark plug. Its function is to increase spark plug life by reducing the rate of erosion of the spark plug points. Thus spark gap or distance the spark has to jump increases very slowly. Consequently, the secondary voltage does not have to increase very much with resultant less rapid erosion.

This is accomplished by increasing the resistance to flow of transformer-primary oscillating current across the spark plug gap. Fortunately, it does not increase appreciably the voltage necessary to jump the spark plug gap the first time which is the spark that ignites the cylinder charge. (See Figs. 18 and 19 showing an oscillogram of the voltage crossing the points with and without a resistor in the circuit.)

Use of resistors also reduces arcing of the interrupter points in the primary circuit caused by the inductive back-kick. There are plugs on the market with small resistors in their insulators but these are inadequate for this type of service. Fig. 17 shows such a resistor which does not adversely affect operation when used with a 250,000-ohm resistor as its 1000- to 2000-ohm resistance is small, percentage-wise.

Some Other Considerations

Manual ignition switches should have ample and positive contacts, particularly on battery or rectifier systems. They should not be used for stopping an engine. Automatic safety shutdown switches should not be employed for stopping the engine under any circumstances unless they shut off fuel at the same instant. All shutdown devices should shut off the fuel first and then the ignition. Magneto ignition does not require this switch.

On engines employing full diesel compression, an ignition failure safety switch which also shuts off the fuel is standard equipment. This switch must be reset by hand before starting in event that it has functioned through a current failure.

Explosion-proof ignition has not been developed and is not available. The present equipment will not function if installed in explosion-proof cases. Explosion-proof ignition switches, junction boxes, contactors and conduit are available and quite bunglesome. They require more room and their cost makes their use questionable in view of the fact that the other component parts are not explosion-proof.

Electrolysis of plant piping has in the times past been partly or wholely blamed on the primary circuit of the ignition system which is grounded to the engine. Therefore, some customers specify no grounding which means that with such a system the battery, the spark coil, and the interrupter are in a circuit without any grounds. Apparently the secondary circuit being grounded through the spark plug has not been blamed since it is impractical to insulate to this extent.

Tests conducted by various ignition manufacturers, as well as the Battelle Institute analysis have shown that grounding of the primary to the engine has no effect on the action of electrolysis on plant piping. Electrolysis is caused by a couple of chapters of other reasons.

Ignition analysers that can be connected through switches to the primary circuit (and used with engines in operation) have been used on the larger multi-engine aircraft for several years. They detect malfunctioning of any part of the ignition system from breakers to spark plug points by showing traces on a screen. Both Bendix Scintilla and the Sperry Gyroscope Co. have been modifying this to the slow-speed engine. This instrument will no doubt be popular and its cost justified, especially in a station with a large number of units, as it saves time by eliminating guess-work and tedious individual checks of the various components in the system.

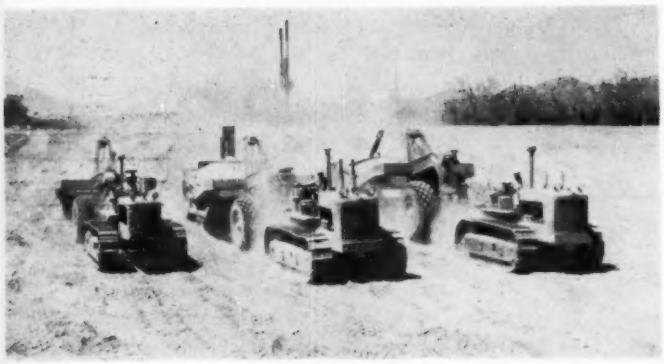
Conclusion

The choice or selection of an ignition system depends upon the type, size, and service of the engine, as well as installation and sometimes personal preference and prejudices. Obviously a small single engine installation operating at a narrow speed range would best be served by a magneto, while an engine with a very wide and slow speed range would operate best on battery or rectifier system. On anything in between you pay your money and take your choice.

In conclusion it must be emphasized that an engine is no better than its ignition system; while the best system has not yet been made, at this stage of development good ignition can be obtained. If it is given intelligent care and service, it will perform reliably and efficiently—but eternal intelligent vigilance, orderliness, and cleanliness is the price demanded.

The various illustrations of magnetos, spark plugs, resistors and oscillograms and permission for their use have been furnished by American Bosch Corp., Scintilla Div. of Bendix Aviation Corp., The B G Corp. Champion Spark Plug Co., and Stitt Ignition Co.

I-H Roundup



A trio of I-H crawler tractors with matched scrapers hi-ball along with heaped loads during part of the demonstrations. From left to right are: TD-18A and Model B-113 14-cu yd self-loading scraper; TD-24 with a B-170A self-loading 21-cu yd scraper; and a TD-24 with a 27½-cu yd B-250 push-loaded scraper.

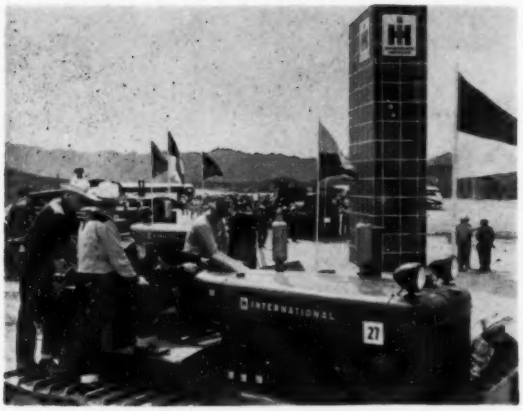
Two models new to the I-H line appear below — the 200-hp Model TD-24 crawler with torque-converter drive, rigged to push-load the new 2T-75 rubber-tired tractor-scraper combination.

INTERNATIONAL HARVESTER held its Industrial Power "Roundup" during the last three days in March at Phoenix, Arizona. In attendance, were more than 600 distributors from the U.S. and foreign countries.

Actual site of the "Roundup" was International Harvester's 4200-acre Phoenix Proving Grounds. On March 29th, following the official opening of the "Roundup," 80 pieces of machinery in the I-H Industrial Power line passed in review before the crowd-packed stand. The first day's show consisted of a parade of the entire International line of earthmoving and materials handling machines including the units produced by the Frank G. Hough Company, I-H subsidiary.

On the second day, actual demonstrations of the equipment shown the previous day took place at various locations scattered throughout the proving grounds. Movement of the distributors was accomplished by the use of 14 large buses. To maintain the tight time schedule, an elaborate radio network was employed through the cooperation of the Arizona National Guard.

Additional demonstrations and talks filled the third day. The finale to the "Roundup", said to be the greatest show of its type ever presented, was a thundering "stampede" of equipment representing some 10,000 horsepower past the grandstand.

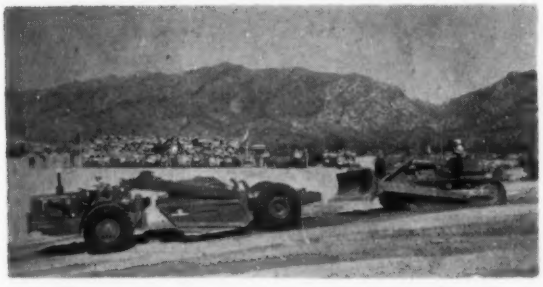


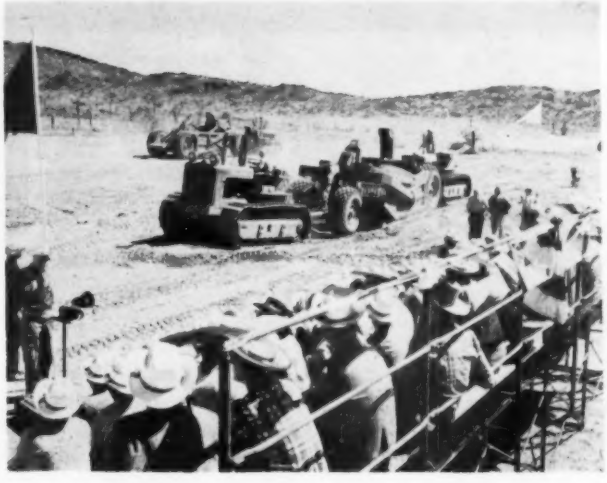
Parts of more than $2 million worth of equipment assembled along an avenue called the "Lane to Leadership", for the more than 600 distributors to inspect. The site is a section of an airstrip on the Phoenix proving grounds (above and below).

Roundup's host, Harold T. Reishus, I-H vice-president and executive head of Industrial Power Div., takes the wheel of a 2T-75 rubber-tired high-speed scraper. Onlookers (r to l) are I. P. Payne and C. E. Jones, Industrial Power Div. sales manager and assistant, respectively.

At another location, distributors witness the loading of a Model 2T-55 scraper to its 13-cu yd heaped capacity, assisted by a 155 draw-bar hp Model TD-24 tractor.

Also new to the I-H line is the Drott grubber blade which, in this case is mounted on a TD-18A. Drawn by the crawler is an off-set disc harrow.





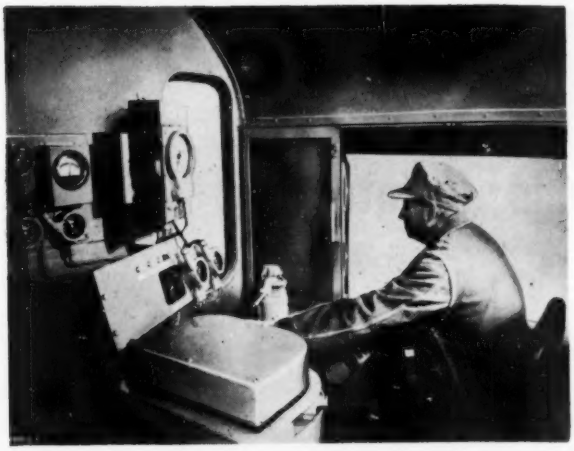
Here, two TD-24 crawlers team up to load the Model B-250, 27½-cu yd (heaped) scraper. The crawlers are rated at 155 drawbar horsepower.

MULTI-PURPOSE LOCOMOTIVE

Called the DL-600, this latest addition to Alco's diesel line is a versatile unit rated 2250 horsepower.

FLEXIBILITY of operation perhaps best describes the DL-600. It has been designed as a heavy-duty, all-purpose unit. Built for high-speed, main-line freight or passenger assignments, the locomotive is also designed for slow-speed, heavy drag service and is equally at home on medium-speed local freight runs or yard transfer and switching assignments.

Although it is a hood-type unit, it differs in outward appearance from other Alco road switchers in that its hoods are the same height as the cab. Another distinction noted at first glance is the recess found in each of the



Features of the roomy cab of the DL-600 are the new low control stand, location of the air brake valve, Noise-resistant insulation, and two large air-induction cab heaters.

four corners of the hood. These contain the 45-degree number boards, classification lights and sand box covers. To provide maximum visability, the locomotive has been designed to operate with the short hood forward.

Power for the DL-600 is supplied by the improved Model 244 Alco diesel. This is a 9-in bore by 10½-in stroke engine of the vee-type having a total of 16 cylinders. It has been rated at 2250-hp which is developed at a full-load speed of 1000 rpm. Engine starting is effected by motorizing the generator with current supplied by storage batteries, in keeping with standard procedure.

Cooling water is circulated through the engine, radiators and lubricating oil cooler by a gear-driven, centrifugal pump. Radiator air inflow is controlled by a simplified modulated shutter control and a variable-speed fan, the latter of which is controlled by an eddy-current clutch.

Overhead view of the DL-600 during a recent demonstration. Note location of sand box covers in hood recesses. It is designed for high-speed passenger and freight service as well as local freight and yard switching assignments.

A feature of the improved Model 244 engine is the water-cooled turbocharging system which has been designed to provide lower maintenance costs and more rugged construction. The air-cooled turbochargers formerly used with this engine have been replaced with water-cooled units. The new models are said to offer improved acceleration characteristics due to their smaller diameter impellers.

The main generator contains both main and starting windings. It is mounted directly on the end of the engine, requiring only one generator armature bearing. The exitation alternator is mounted on the generator as is the auxiliary generator which supplies power for lighting, battery charging and control circuits. The auxiliary generator operates at a constant voltage and is controlled by a voltage regulator. Both the alternator and auxiliary are gear-driven from the main generator. The 3-phase alternator supplies main generator exitation through a rectifier. This system has been designed for simplified maintenance.

Increased dynamic braking power has also been incorporated into the unit. The locomotive is available with 3400 dynamic braking horsepower, said to be the highest level yet offered on rail motive power. To this fully-automatic braking control can be added as a modification.

Maximum dynamic braking forces range from 62,800 lb at 65 mph gearing to 51,500 lb with 80 mph gearing. The rear hood has been raised to permit application of the dynamic brake over the engine.

Air for traction motor cooling is supplied by two multi-vane blowers, each of which supplies air to one of the 3-motor trucks. The front blower is gear-driven off the main generator, while the rear blower is belt-driven from the shaft between the air compressor and the radiator fan.

Following are the continuous tractive efforts, corresponding to the gear ratios, being offered in the DL-600.

Maximum Speed	*Gear Ratio*	*Cont. Tractive Effort*
80 mph	64-19	65,100 lb
75 mph	65-18	69,800 lb
65 mph	74-18	79,500 lb

Condensed Specifications

Short-time tractive effort	107,400 lb for 4 minutes
Starting tractive effort	97,500 lb at 25% adhesion
Weight, maximum	390,000 lb
Weight, minimum	325,000 lb
Brakes	clasp type
Dynamic braking capacity	3400 hp max.
Height, maximum	14'8⅜"
Width, maximum	10'1⅝"
Length, inside knuckles	66'5"
Trucks	two 6-wheel, 3 motor
Wheel diameter	40"
Lube Oil	250 gal
Fuel Oil	1350 gal
Fuel oil, without boiler	2400 gal
Engine cooling water	280 gal
Sand	40 cu ft

Diesels and Maintenance Pay Off

Maintenance is a key factor in the operation of Braswell Motor Freight Lines. It is well planned and pays off in dollars saved—one cent per truck mile adds up.

BRASWELL Motor Freight Lines is headquartered at El Paso, Texas. It owns and operates 70 Kenworth tractors, all powered by 200-hp, Model NHB-600 Cummins engines. This is a busy line and one of the fastest growing truck companies in the country. An idea of just how busy, can be seen from the following truck mileage averages: 175,000 miles per year; 14,000 miles per month; 3300 miles per week; 480 miles per day; or 20 miles per hour.

Maintenance of these diesel-powered rigs is based on manufacturer's recommendations. This has cut operational expenses for Braswell by one cent per truck mile.

With El Paso as the dividing point between East and West, 35 Model 522 Kenworths operate between El Paso and Los Angeles, including the Tucson, Phoenix, and Yuma, Arizona triangle. The other 35 run from El Paso, east to and between such Texas cities as Fort Worth, Dallas, Waco, Houston, and San Antonio. The 35 eastern tractors are all Model 521 Kenworths.

J. V. Braswell, president of the company, estimates that 56 of the 70 units are on the road at all times, seven days a week. "This", he says, "requires good trucks with dependable power.

"We operate all our units on scheduled runs. All of our trucks are on time cards—like the bus companies. We have a reputation for fast, dependable service, and I can say without any reservation, diesel engines have contributed greatly to our success."

How It Started

J. V. Braswell started in the trucking game in 1930, hauling cotton from the Dallas and Waco areas to the Houston cotton presses. In 1933, he owned a truck and drove it for Gillette Motor Transport Company of Dallas.

In 1935, he purchased an Interstate Commerce Commission permit for cartage rights between Dallas, El Paso, and San Antonio. Although he was still driving, he owned one other truck. By 1942, he was operating 16 gasoline-powered rigs and in that year he purchased an ICC certificate permitting him to haul between San Antonio and Houston.

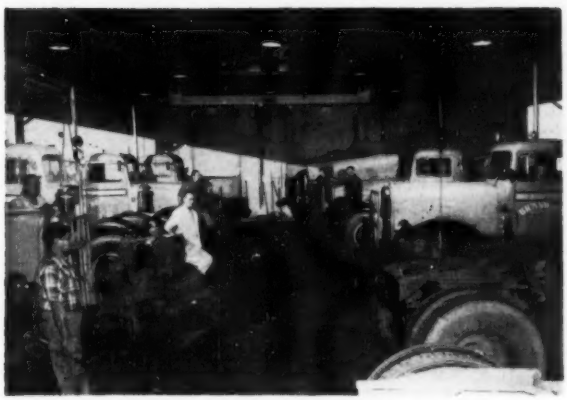
Additional permits were purchased in 1943 and 1949, allowing Braswell service to be extended from El Paso to Los Angeles, and from Dallas to Waco to Houston, and from Dallas to Corsicana to Huntsville to Houston. These ICC certificates authorize Braswell service over a total of 2863 highway miles, serving communities in four states.

Since his start in the trucking business, Mr. Braswell has specialized in fast LTL (less than truck load) service. Today, he estimates that his units handle an average of 9 million tons of LTL freight a month.

More Expansion

During 1952, Braswell Motor Freight opened two new terminals; one in El Paso costing over $700,000 and

Upon return to El Paso from a scheduled run, cargo is unloaded and the rigs go to the wash rack (above). Following this units are lubricated and refueled. The next stop is the main shop building, part of which is shown below.



covering 10½ acres; the other in Los Angeles, which involved an expenditure of $400,000 and which covers eight acres. In addition, Mr. Braswell reports that four new terminals in Fort Worth, Dallas, Houston, and San Antonio, costing an estimated total of $500,000, were started in 1953.

These new facilities are needed to take care of added business inasmuch as the company's volume has increased about 25 per cent a year, each year, for the last five years. Braswell has a ratio of operating expense to receipts of 68 per cent.

Diesels Pay for Themselves

Following acquisition of an ICC permit from El Paso to Los Angeles in 1943, Mr. Braswell started an exhaustive study of trucking organizations on the West Coast. As he says:

"I spent considerable time on the West Coast talking to truck operators. They all used diesels for power, and convinced me that I should too; so I bought six Kenworth tractors with 200-hp Model NHB-600 Cummins diesels as well as six new trailers for about $67,000.

"At the very start of our experience with diesels, we figured that a diesel-powered truck would replace approximately two gas rigs. This proved to be true as we put our first six Cummins-Kenworth tractors on the Los Angeles run replacing 11 gasoline-powered trucks.

"It is interesting to note that we actually paid for our first six diesel rigs as well as the trailers in one year as a result of the savings afforded by a diesel operation. We saved money in time, extra drivers, fuel, and maintenance, not to mention costly downtime."

Maintenance

Mr. Braswell is a firm believer in preventive maintenance. A casual inspection of the modern facilities at his company's new El Paso terminal will convince you how serious he is about this phase of the trucking business. As he says:

"The only way to operate in this business is to have a good maintenance program. We have built here at El Paso, a shop which we believe is second to none, in which we practice a rigid maintenance program. The engine phase of this program, set up to manufacturer recommendations, has cut our operation expense one cent a mile."

Preventive Maintenance in Action

Here's what happens to a Braswell rig following its return to El Paso from a scheduled run.

Following the discharge of cargo at the dock, the rig heads for the steam and wash racks. These functions are accomplished in a 60-ft by 50-ft steel building having two racks each of which can accommodate a complete tractor and trailer.

The truck and trailer having been washed, the rig is driven through to the lubricating racks which are housed in a special 72-ft by 50-ft steel building. Cleanliness is paramount in this department. This building has two identical pits, painted white, and each illuminated with eight indirect lights. Transmission, differential, and chassis grease are supplied from four reels in each pit.

In addition, there are overhead reels for lube and fuel oil. A 10,000-gal storage tank for lube oil, and three tanks with a total capacity of 40,000 gal of fuel oil, are buried in the ground nearby. It is estimated that it takes 45 min. to complete lubrication work on each tractor and trailer.

After being properly lubricated, the rig is driven to the main shop building, a beautiful, completely air conditioned structure, 295-ft long and 72-ft wide.

The shop building has 13, 15-ft by 72-ft stalls, with overhead doors. Six of the stalls are used for trailers; six are for tractors; and one compartment—completely walled off—is a paint shop. It is possible to drive through all compartments. Present plans call for the

COMPARISON DATA—EL PASO TO LOS ANGELES AND RETURN

	Test No. 1	Test No. 2	Test No. 3
	Tractor No. 33D	Tractor No. 33D	Tractor No. 35D
	May 23-25, 1948	April 22-25, 1952	June 2-5, 1952
Tractor Condition	New—1712 miles at test start	25,000 miles since rebuild job	250,000 miles: just before overhaul
Pay Load	51,464 lb	52,328 lb	53,449 lb
Wind Condition	None	40 mph 138-mile head wind	None
Weather Condition	Clear	Clear	Rain from El Paso to Lordsburg, N.M.
Road Condition	Dry pavement	Dry pavement	Wet pavement from El Paso to Lordsburg
Diesel Fuel Per Gallon	301	293.4	349
Average Miles Per Gallon	5.462	5.76	4.842
Crankcase Oil Make Up	None	None	3 quarts
Average Miles Per Quart	None used	None used	563 miles
Maximum Miles Per Hour	50	55	55
Engine RPM Average	2019	1993	2001
Ambient Air °F Average	72	65.7	73.2
Engine Water °F Average	156.8	174.8	170.2
Crankcase Sump °F Average	189.3	187.6	190.5

construction of a new trailer maintenance building in the rear of the present shop.

In the trailer room, there is equipment for complete rebuild, front end, and "wreck" work. Every unit is checked on a production line basis before being okayed for the next trip. Braswell also fabricates special mufflers, as well as 200-gal fuel tanks in this department.

The tractor is then driven to an inspection stall. If it is necessary to remove an engine for rebuild from a tractor, this can be done and an exchange unit installed in a minimum of time.

Engine Rebuild Program

Under the direction of Floyd Gelfius, Braswell's shop superintendent, and Vernon Gressel, unit rebuild supervisor, each unit is then rebuilt to manufacturer specifications.

The rebuild section of the shop is a room with no windows. This, according to Mr. Gelfius, "eliminates the possibility of dirt or dust getting inside the engine during its rebuild. This room also has every special tool needed for the complete overhaul, rebuild, and servicing of a Cummins diesel."

To aid in the cleaning of blocks and sub-assemblies, Braswell has constructed a special thermostatically controlled, insulated, 752-gal tank.

Following the inspection of all parts, all sub-assemblies are rebuilt and the complete unit reassembled. The rebuilt engine is then placed on a Taylor dynamometer which has a capacity of 320 hp at 2100 rpm. Every engine is run-in for 18 hr.

Other features of the rebuild unit room include a hydroborer and connecting-rod line fixture, a special 60-ton air-operated press, a lathe, and an overhead crane with a capacity of two tons that moves the full length of the room.

Care Pays Off

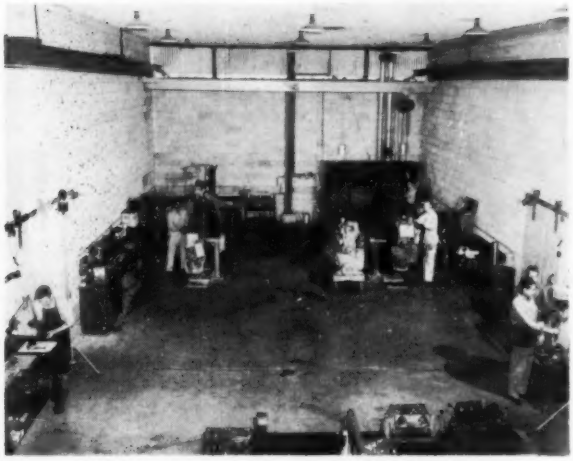
Does all this care pay off for Braswell? Mr. Gelfius points out:

DRIVING TIME BY SECTION (DRIVER TIME MINUS STOP OR CHECK)

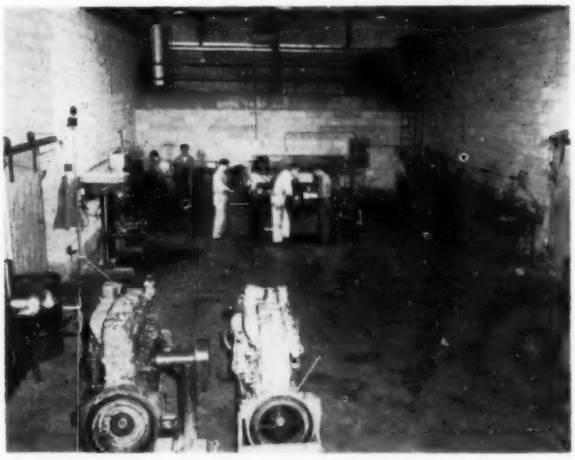
	Test No. 1	Test No. 2	Test No. 3
El Paso-Tucson	15 hrs: 04 min	14 hrs: 18 min	15 hrs: 21 min
Tucson-Yuma	10 hrs: 42 min	9 hrs: 58 min	10 hrs: 24 min
Yuma-Los Angeles	13 hrs: 34 min	12 hrs: 44 min	12 hrs: 59 min
Total Round Trip Driving Time	39 hrs: 20 min	37 hrs	38 hrs: 44 min

AVERAGE MILES PER HOUR BY SECTION (SECTION MILEAGE—ACTUAL DRIVING TIME)

El Paso-Tucson	43.297	45.59	42.5
Tucson-Yuma	45.985	49.36	47.3
Yuma-Los Angeles	40.275	42.89	42.7



Two views of the engine rebuilding shop are shown above and below. As will be noted from the illustrations, this room has no windows. Ventilation is provided by an air conditioning system. This arrangement has been employed to keep dust at a minimum in the rebuilding shop.



After engines are rebuilt and run-in for 18 hours on the dynamometer, they are painted Braswell green and stored in the parts room (below).

"Every one of our units averages between five and six miles to the gallon of fuel consumed. We change our lube oil every 3000 mi, and none is added between changes. In addition, we follow factory recommendations on all periodic or mileage checks."

Here's a typical history of a diesel rebuilt in Braswell shops after 250,000 miles of service:

Unit No. 2—Rebuilt January 8, 1952
12,920 miles—cleaned fuel pump screen
18,520 miles—tune up engine
34,420 miles—exchange fuel pump
60,210 miles—exchange injectors
91,900 miles—exchange heads
104,550 miles—adjust injectors and valves
110,990 miles—idle adjustment checked on fuel pump
114,000 miles—throttle clevis pin replaced

"The parts exchanged," according to Mr. Gelfius, "were not bad, but needed some work before being used again. In 114,000 miles, logged in approximately eight months, only $70 in new parts were used on this engine."

Tests

Substantiating the soundness of the Braswell practice of rebuilding engines to factory specifications, were the recent findings of W. W. McCutcheon, Standard Oil (of California) fuels and lubricants engineer.

Mr. McCutcheon made three round trips between El Paso and Los Angeles in Braswell trucks. (The results are shown on the accompanying chart.) The first trip was made with an NHB-600 in tractor 33-D which was new; the second in tractor 33-D after the installation of a rebuilt engine; and the third in tractor 35-D just previous to engine overhaul and after 250,000 miles of service.

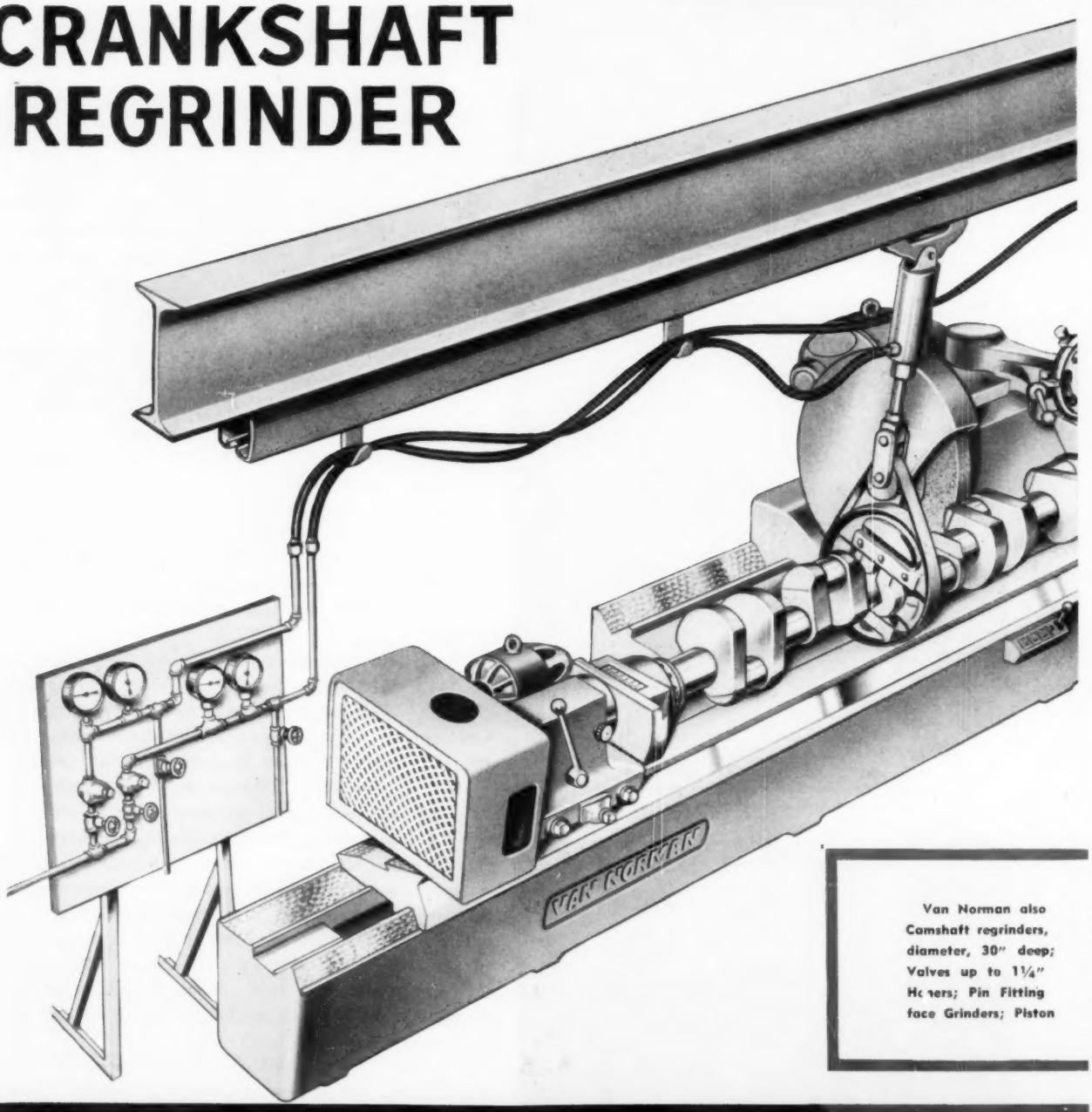
The rebuilt unit averaged 5.76 mpg; the new unit averaged 5.462 mpg; and the engine in tractor 35D averaged 4.842 although it had 250,000 miles on its cyclometer. These findings show that when equipment is rebuilt in compliance with the manufacturer's specifications, it will perform as efficiently as a new engine.

These units are able to maintain their schedule by reason of long mileage between stations, and efficient control over each run by means of a Tachograph installed in each tractor which records the miles travelled, the speed, all stops, etc. In addition to this, Braswell has teletypewriter service between stations to provide an up-to-the-minute, accurate exchange of information for better, faster, and more efficient scheduled service. Braswell knows the precise time of departure and arrival of each unit.

Thousands of shippers have found that Braswell has the coverage and a reputation that guarantees quick, dependable, safe deliveries for their freight shipments. In order to continue to satisfy these customers as in the past, Mr. Braswell says he will rely on that diesel power under the hood to do the job of "moving freight from where it is to where it isn't".

NEW !

REVOLUTIONARY VAN NORM CRANKSHAFT REGRINDER



Van Norman also Camshaft regrinders, diameter, 30" deep; Valves up to 1¼" Hc ers; Pin Fitting face Grinders; Piston

Quality is the reason that's why

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- - For the LARGEST DIESEL ENGINE SHAFTS

This NEW Van Norman Crankshaft Regrinder Quickly and Accurately regrinds the LARGEST Diesel Crankshafts. Van Norman's new air controlled "Compensators" eliminate sag and support the shaft, which makes it easy to restore new shaft performance to those worn shafts.

The NEW Van Norman Diesel Engine Crankshaft Regrinder is equipped with double end drive, outboard counterweights and 54" Wheel. It is easy to operate and is built for long life and accuracy. Van Norman builds a Crankshaft Regrinder for every size requirement. The machine shown is the No. 111ELW-42" X 180" for shafts up to 180" long.

builds for the Diesel Shop: Cylinder Boring Bars up to 9" in Valve Refacers, Heavy Duty for stem diameter; Automatic Wet Equipment; Automatic Wet Sur-Grinders.

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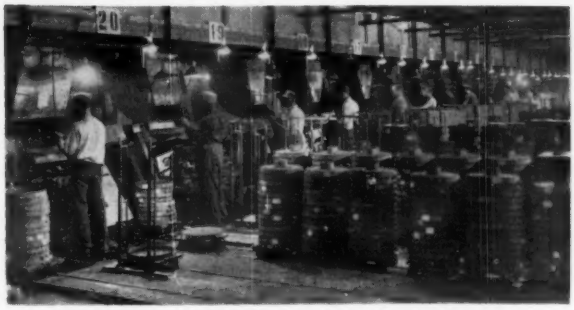
"It Pays to Van Normanize"

Piston Rings for Pipeline Engines

By John W. Pennington, Manager, Technical Dept.
Metal Products Division, Koppers Company, Inc.

You should know some of the factors concerning piston rings. Proper selection of piston rings can influence operating costs.



First step in the manufacture of piston rings is the foundry where molds and flasks are prepared

WITH its continued growth, the gas pipeline industry has become a separate major market for replacement parts as well as original equipment. Major pipeline companies have grown to the point that each one is a substantial individual customer.

Pipeline companies have developed individual buying policies in regard to replacement parts. Some outfits procure replacement parts through the engine manufacturer. This results in having parts that have been approved and tested by the engine builder and inspected by him to standards required for his engine. Some, as a matter of policy, procure individual replacement parts from the parts manufacturer. With some of them this means a parts manufacturer approved by the engine builder, while with others it means any reputable manufacturer of the particular part. Some companies have no specific policy on replacement parts but buy from whatever source seems to be most satisfactory in a particular situation.

There are good reasons for and against each of these policies, and it is not our purpose to discuss these reasons in detail. Two points that we might make in regard to piston rings are:

1. The engine builder has tested piston rings for his engine, purchasing and supplying those that he has found to be most satisfactory.

2. Specialized problems such as supplying special sizes and also specifying and supplying different types of replacement sets for different service conditions make it somewhat difficult for the engine builder to supply all of the replacement requirements for the engine.

Some Cost Factors

Pipeline operators are in a good position to evaluate overall operating costs since they run large numbers of engines under similar conditions. They keep good records and are therefore in a position to know actual costs and potential savings to be found through use of certain parts. In many cases, initial cost of the specific part involved is the smallest item in connection with actual overall costs or possible cost savings.

As far as piston rings are concerned, the various cost items might be listed as follows:

1. *Actual initial cost of rings.*
2. *Operating costs that may be affected by rings (primarily lubricating oil consumption).*
3. *Length of time between overhauls.*
4. *Effect on mating parts such as cylinders and pistons.*

The first item, initial cost of the piston rings, is usually the least important cost item, although in many cases it is still the controlling factor as to what type rings are obtained.

Savings on lubricating oil consumption will frequently repay several times over the additional cost of a more expensive set of rings. However, reducing oil consumption can reach a point of diminishing returns so far as savings are concerned, and reach a point of danger so far as susceptibility to scuffing or high wear under adverse operating conditions are concerned.

For example, a 1000-hp engine operating for 1000 hours will have produced one million hp hr of work. The following chart shows savings that might be made by various degrees of improvement in crankcase lubricating oil consumption.

Oil Consumption Rate	Total Used Per Million hp hr	Cost Per Million hp hr at 50c gal	Savings Due to Improvement in Consumption
2000 hp hr/gal	500 gal	$250	———
4000 hp hr/gal	250 gal	$125	$125
8000 hp hr/gal	125 gal	$62.50	$62.50
16000 hp hr/gal	62.5 gal	$31.25	$31.25

As can be seen, substantial savings are possible by reducing crankcase oil consumption. At some point in this reduction, however, the value of oil saved becomes relatively insignificant when compared to overall operating costs, oil used in lubricators and compressors, and the risk of scuffing and high wear due to running under borderline conditions.

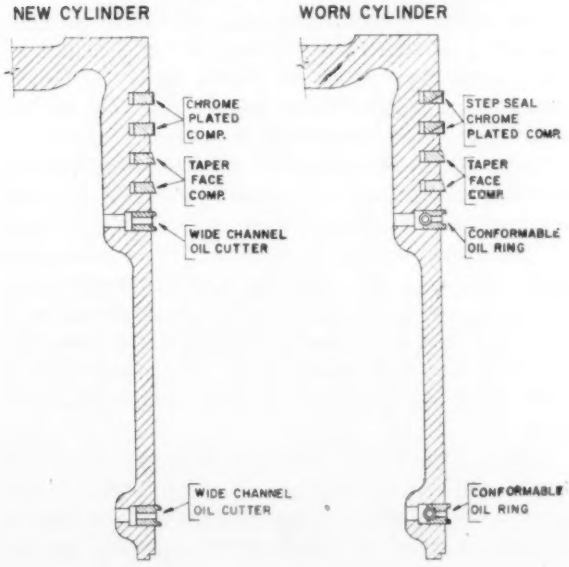
If use of a more expensive set of rings can substantially increase the period between overhauls, saving made will far outweigh the additional cost of the rings.

After casting, rings are machined to proper sizes. In this shop, medium and large sized rings are machined

If the overhaul interval is determined by other factors as may be the case in pipeline operation, or if not enough improvement can be made to gain a worthwhile additional period, this factor in itself may not be significant. However, characteristics of the set which lead to longer overhaul intervals are usually those which cause reduced wear on the mating parts.

Piston rings may have a very definite effect on the overall life of the cylinder and piston. Since cost of these parts is many times that of the rings themselves, this factor should definitely be considered in piston ring selection. For example, it has been well established that under almost all operating conditions, a chromium-plated top ring will reduce cylinder wear to half or less of the wear that will be found with a conventional top ring. This factor alone will certainly more than repay the additional cost of chromium-plated rings under almost any operating conditions.

Typical piston ring sets for 4-cycle engines.



Another factor to be considered is ring breakage which may cause damage to the piston or cylinder. If breakage is found to occur, it is quite likely that the additional cost of a high-strength ring will be more than justified by forestalling the chance that the piston or cylinder may be damaged.

Selection Factors

These are general factors which should be considered in selection of piston rings. A more specific question might be when and why different types of ring setups are indicated. The engine builder supplies rings with the engine which have proven satisfactory under most operating conditions. No matter if replacement rings are to be purchased from him or from a piston ring manufacturer, the question arises as to whether the same types of rings should be installed, or under what conditions a change in setup may be indicated.

One approach to this problem is to consider some of the situations which may be encountered.

1. Consider an engine which has given long hours of good performance with satisfactory oil consumption, but due to some drop-off in performance or other factor is to be overhauled. During overhaul, total wear on the cylinder and other parts is found to be very small.

This would indicate that we should expect another period of good performance if a setup the same, or essentially the same, as the one removed is again installed. Field experience with the particular type of engine may, of course, have indicated that improved performance can be expected with some modification in ring setup.

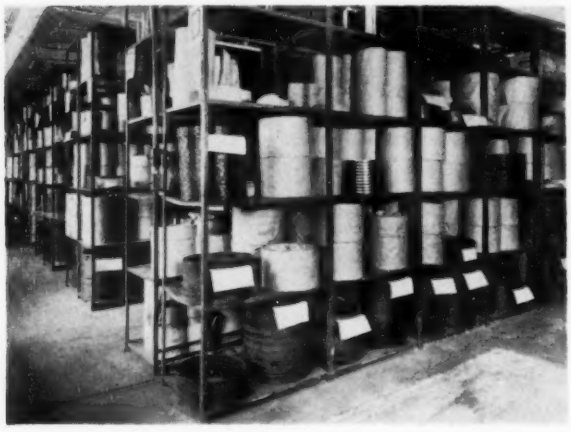
2. Consider a second engine which has given long hours of satisfactory performance with acceptable oil consumption, but performance has been falling off and the engine is overhauled. During overhaul, the cylinder and other parts are found to be substantially worn even though the wear rate is satisfactory (this might be the second or third overhaul for the engine).

In this case, even though wear rates are satisfactory, it will probably be necessary to use a modified ring setup in order to restore optimum operating performance. Typical steps which might be necessary to reestablish good oil control are the use of rings with joint seals so that blowby will not be excessive even with worn cylinders, use of taper face intermediate rings to provide good initial seating, and the use of more severe oil rings such as those of the new conformable type.

3. Consider a third case where the engine has not given satisfactory performance and is either due for early overhaul or despite unacceptable oil consumption it is decided to run the engine to a regular overhaul period. At overhaul, it may be found that there is excessive wear of rings and cylinders, there is ring breakage, there is ring sticking, or some other abnormal condition has occurred.

It should be noted that in most of these cases, unsatisfactory performance is due to some factor in opera-

Above, a plating shop, another of the closely-controlled steps in the manufacture of piston rings. Finished rings are labeled and stocked as shown below. Rings for your engine are possibly somewhere on those shelves.



tion of the engine rather than to a difference in the engine or its parts from similar engines which have performed satisfactorily. It cannot be said that no variation exists between engines of a given model or even that there is no variation between parts used for a certain engine. But it can be safely said that the differences encountered in engines or parts are very small compared to differences in conditions under which engines must operate.

As an example, studies have shown that cylinder and ring wear rates may be multiplied by a factor of 100 by changing only the fuel. Despite the fact that this is an extreme example, it does give an indication of the tremendous effect which operating conditions can have on engine life.

Regardless of the approach used, however, the problem is to obtain satisfactory performance under the particular conditions which are encountered. This may require a quite different ring setup from that normally satisfactory for the engine.

If high wear is encountered, such things as a very heavy chromium plate may be indicated, or it might even be necessary to chromium plate all rings. Chromium plating up to 0.030-in on the face has been applied to some large rings. It should be noted that in considering chromium-plated rings, the thickness of the plate can be just as important as whether or not the rings are plated.

If breakage is encountered, a change in ring section or the use of a high-strength material such as malleable iron or ductile iron may be indicated. Generally speaking, it is advisable to use chromium plate or some type of special surface finish on these materials.

If high blowby is encountered, it may be necessary to use one or more seal joint rings. Although it has been common practice to put these joint seal rings in a lower groove, the seal is actually much more effective in the top groove. Danger of breaking the joint is greater in the top groove and unless relatively thick rings are used, the joint seal may be practical only if a high-strength material is employed. If severe ring sticking is encountered which cannot be cured by changes in the fuel, lube oil, or operating temperatures, it may be necessary to go to a keystone-section ring.

What to Reasonably Expect

There is no magic cure for any particular piston ring problem and it is well to beware of overemphasizing either the occasional exceptionally good or exceptionally bad experience found on a particular engine. As mentioned previously, many factors can affect the individual case. The important thing is to raise the overall performance level of the group of engines and to solve individual problems that arise.

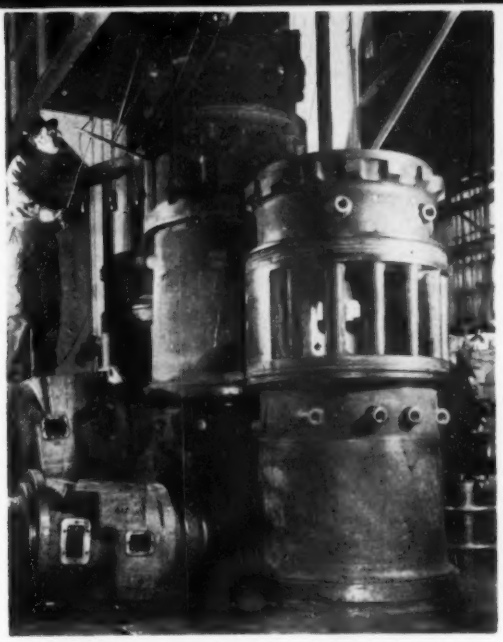
The pipeline operator should justifiably expect capable engineering assistance, control of product quality, and satisfactory service from the piston ring supplier. In the matter of engineering assistance, they should expect help from the supplier in advising the best setup for difficult jobs or in selecting the optimum ring setup for a particular condition, with original cost, operating performance and life considered. Engineering assistance should include recommendations on wear limits, regrooving of pistons, or any other needed help to solve the problems at hand.

In the matter of product quality, the pipeline companies should expect consistently the same carefully controlled product. Quality control should include both the material from which the part is made and dimensional characteristics of the finished ring that the engine manufacturer expects and insists upon.

In the matter of service, the pipeliner should expect stocks of piston rings to be readily available for principal engines. He should expect rapid service in cases of breakdown or other emergency. Also, reasonably quick service on odd sizes that may be necessary due to ring groove wear or other factors should be expected, even though it is obviously impractical for either the engine builder or the piston ring manufacturer to stock rings which will take care of every conceivable situation.

Piston rings are an important working part of the engine and careful selection of rings, together with good operating and maintenance practices, can have a considerable effect on overall operating costs.

From small ones to large ones—these are typical of the cylinder liners processed by Van der Horst.



Even larger are these cylinders which represent a huge investment. Vanderloy will be used to restore these.

Q's and A's on Porus-Krome and Vanderloy

VAN DER HORST CORPORATION is one of the world's largest electroplating industries and inventors of the Porus-Krome and Vanderloy processes. They believe that their customers are interested in learning and are entitled to know just what production procedures are accountable for ultimate product quality.

Implementing this, Bill Fritton, vice president and sales manager, set up a series of customer seminars last fall at the company's Olean, N. Y. facilities. (They have plants in Terrell, Texas and Hilversum, Holland, with Spar-Tan Engineering Co. of Los Angeles as West Coast licensee). Each seminar lasts two days and includes an introduction to the principles of electroplating, discussions of the metallurgical character of plated metals, and a comprehensive view of operations.

Power cylinders are followed through the production line from the time of receipt to final shipment. Since the first seminar, the following companies have been represented, proving Van der Horst's conclusion that customers are interested in more than just buying a product or service: Pennsylvania Railroad; New York Central; The Baltimore and Ohio; Baldwin-Lima-Hamilton Corp.; Socony-Vacuum Oil; Cleveland Diesel Engine Division, GM; Elgin, Joliet and Eastern Railroad; Seaboard Air Line; Lake Tankers; and Ingram Products.

Throughout the seminars, those attending are encouraged to ask questions about the processes and their applications. When we heard about the seminars, we asked Bill why it wouldn't be a good idea to list the most frequently asked questions. They should represent the things that these people wanted to know or were uncertain about. Logically then, the questions might also be representative of those in the minds of the rest of our industry, and they might want to know the answers too.

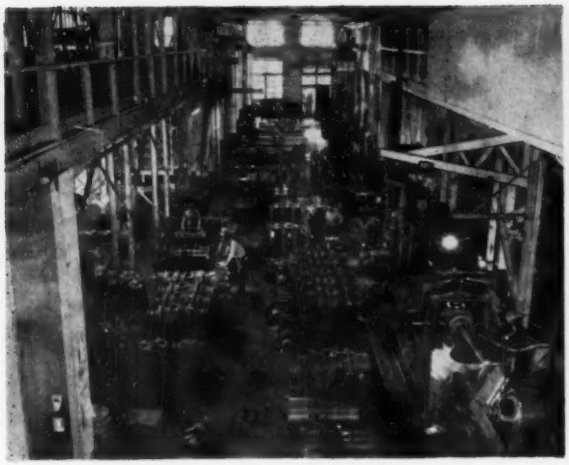
So here they are—industry's questions and Van der Horst's answers.

Q: We have shown, by way of actual engine tests, that the harder the piston ring the more rapid is wear in ordinary liners. Is it not true then that the very hard Porus-Krome liner causes higher piston ring wear?

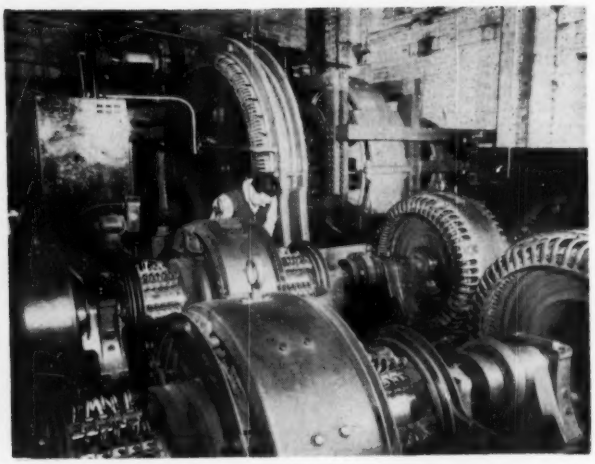
A: Wear is relative to the adequacy of lubrication. Improved lubrication between ring and cylinder wall will account for a reduction in ring wear. The Porus-Krome surface, with thousands of pores or channels for storing lubrication oil, provides for adequate lubrication between ring and cylinder wall. The low coefficient of friction of the Porus-Krome surface also contributes to a reduction in wear. In actual operation the life of piston rings operating on Porus-Krome is increased by approximately 60 per cent.

Q: Does a wear step develop at the top of compression ring travel in the Porus-Krome plated cylinder?

A: The wear or ring step that occurs at the top of compression ring travel will always be present regardless of the materials used for rings or cylinders since the area



In addition to extensive hoisting facilities, considerable space is required for the production processing of power cylinders.



Plating takes power—closely controlled power. One Van der Horst plant requires as much as 1500 kva just for cylinder liner plating.

between the upper limit of compression ring travel and the cylinder head is not a bearing surface. However the depth of the ring step in a liner that had been Porus-Krome plated will be found to be 1/3 to 1/5 of that found in a raw liner for an identical service period.

Q: Is the lube oil consumption affected by plating cylinders with Porus-Krome?

A: Porus-Krome plated liners actually contribute to a reduction in lube oil consumption. After the initial break-in period, the perfect mating of the ring and cylinder surfaces, plus the presence of a depth of lubricant sufficient to resist carbonization, accounts for a reduction in the lube oil consumption. Then too, as wear is reduced, so is lube oil consumption cut down.

Q: *But I have heard complaints that engines with chromium plated cylinders have increased lube oil consumption. What about this?*

A: Engines incorporating cylinder liners that are chromium plated by the Van der Horst process will definitely have reduced lube oil consumption. The type of preparation given the raw (unprocessed) surface of the cylinder bore before plating is applied and the type of finish produced after plating determine whether or not a cylinder will or will not be an "oil hog."

In the Van der Horst process, the cylinder bore is honed to a micro-finish before chromium is applied. This type of preparation eliminates the possibility of ultimately having more than one plane of surface geometry on the chromium surface for the rings to oppose. If a piston ring opposes more than one plane of surface geometry, it is a mechanical impossibility for the ring to seat properly. The finish that is given the cylinder bore after the application of the chromium must be extremely fine, otherwise nodules of plated chromium would present an obstacle to the free travel of the rings.

Q: Does parco-lubrizing have any detrimental effect in replating a liner?

A: Pre-plate machining or honing of the cylinder bore insures the removal of the parco-lubrizing prior to the actual plating of the cylinder bore.

Q: Is heat generated in the plating process?

A: Yes, but not to a degree where the metallurgical characteristics of the base metal will be affected. Temperatures in the plating bath do not exceed 150°F.

Q: How are surfaces that are not to be plated stopped off?

A: In chromium plating, the throwing power of the chromium is relatively poor, therefore these surfaces that are not directly opposing the plating anode are unaffected by the plating bath. In iron plating, the high throwing power of the iron necessitates stopping off these parts with a wax preparation.

Q: What is the maximum thickness of Porus-Krome?

A: The maximum economical thickness for Porus-Krome only is 0.030-in on the inside diameter. However with Vanderloy plus Porus-Krome, the limit economically is 1 per cent of bore diameter. Large bore cylinders that have been 0.250-in oversize on the I.D. have been re-standardized.

Q: What is the life of a Porus-Krome plated cylinder?

A: A Porus-Krome plated cylinder bore will last three to five times longer than an unprocessed bore operating under similar conditions.

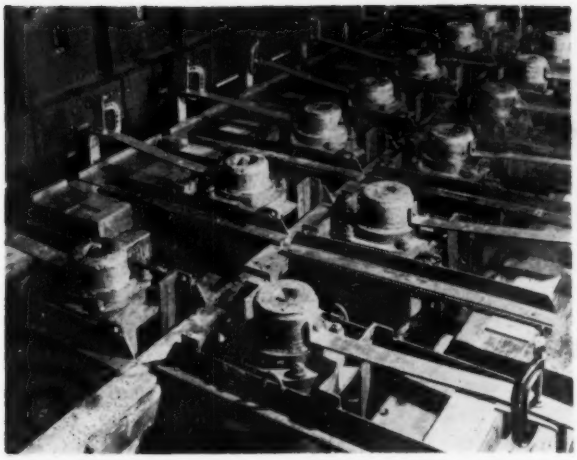
Q: Does ring-to-cylinder wall pressure affect the life of Porus-Krome?

A: No. Actually the ring-to-wall pressure can be increased (within reasonable limits) on a Porus-Krome liner.

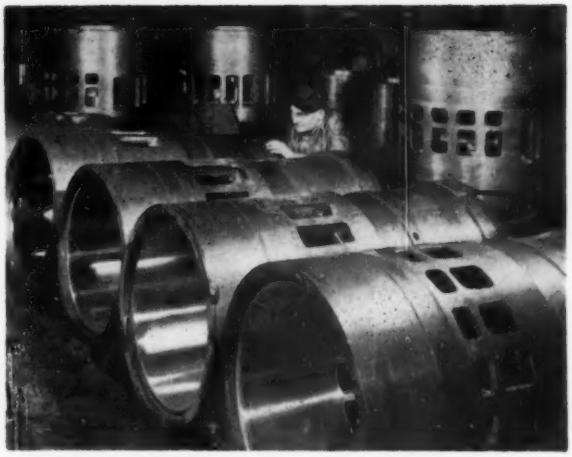
Q: Do you machine a cylinder liner before plating?

A: Yes. Cylinders that are to be iron plated are machined to true dimensions on a boring mill. Prior to the application of Porus-Krome, each cylinder is honed to insure a perfectly smooth and concentric surface.

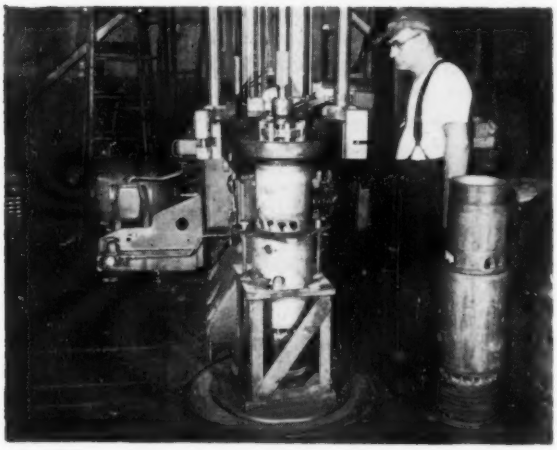
Q: What voltage and currents are used in Porus-Krome and iron plating?



Each type liner requires a special fixture to hold it in the plating bath. The "C" clamps secure the fixture bus to the main power bus.



Each step in the reclamation process is carefully monitored. After plating, the Porus-Krome is checked with an electronic thickness gauge.



Cylinder liner bores are honed before and after plating. This assures even deposition and later a good mating surface for the piston rings.

A: Voltage in the Porus-Krome plating process is approximately 4 volts, with amperage about 3 amps/sq in. In iron plating a similar low voltage is used, but amperage is reduced to 40 amps/sq ft.

Q: What happens after the porosity of the Porus-Krome has worn away?

A: The maximum bore wear usually occurs at the top or inner dead center of the top or innermost compression ring, and only on one side of bore. When the porosity at that point is worn away, the porosity over the remainder of the bore is retained, in most cases until the chromium is worn completely through at this point. Because of this the oil is retained in the porosity below and completely surrounding the area of maximum wear and is delivered to the area of maximum wear by the piston and piston ring assembly with each reciprocation.

Q: Will piston ring land wear be reduced on pistons operating in Porus-Krome plated cylinder bores?

A: Yes. Ring land wear is a function of cylinder wear. Since the rate of cylinder wear is reduced by the application of Porus-Krome. the extent of lateral ring travel is also reduced.

Q: How large a pit in the base metal of a cylinder liner can be tolerated in plating?

A: The size of pits that can be tolerated in cylinder plating is dependent upon the size of the cylinder and the area of the ring face. Since these two factors also govern the size of pits tolerated in an unprocessed cylinder, it can be assumed that pits tolerated in the unprocessed cylinder can also be tolerated in the plated cylinder.

Q: I have seen chromium plated liners peel. What is the cause of this condition and have any improvements been made along this line in recent years?

A: Modern plating methods incorporate improved techniques that rule out the possibility of chromium plating peeling. Peeling in most cases has been caused by improper preparation of the base metal prior to the application of chromium. The raw surface of the unprocessed cylinder bore must be chemically etched before plating is applied; otherwise existing impurities will prevent the atomic bonding of plated to base metal.

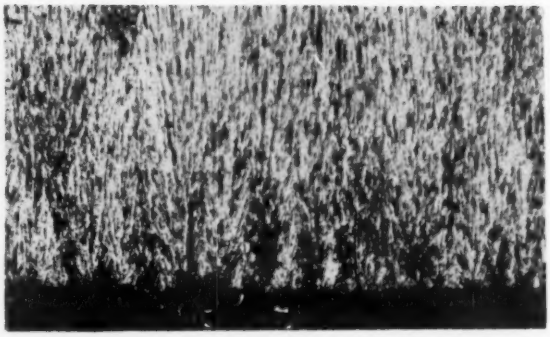
In addition, experience has proven that bond ruptures have occurred where the base metal has been left unplated due to improper plating techniques, allowing the corrosive byproducts of combustion to get between the parent and plated metal. Plating requires the ultimate in quality control. Plating solutions must be checked daily and bond checks must be made periodically to determine that the bond between the chromium and base metal exceeds the tensile strength of the base metal. Chromium so produced will never peel; rather the base metal will disintegrate before bond cleavage occurs.

Q: In view of the long life obtained from cylinder liners that have been Porus-Krome plated, could we purchase a poorer quality cast iron liner to process with Porus-Krome?

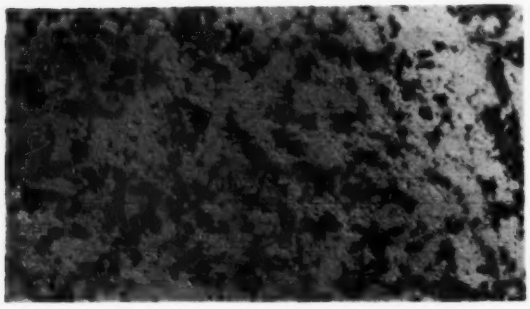
A: The answer to that question hinges on your interpretation of "poorer quality cast iron liner". In no in-

This photomicrograph, original 100x, shows a cross-section of a .004" thick chromium deposit on cast iron. This is the hard, wear-resistant CHROMIUM without the porosity of PORUS-KROME. Except for minimal valleys, the surface is level and dense, affording little hold for oil.
Here you see the meaning of "PORUS". For effective lubrication, a controlled amount of "oil reservoirs" have now been created by further processing. The plateaus between "reservoirs" have been honed to provide a true bearing surface.

Above, a comparison of chromium and Porus-Krome in section. Below, the surface appearance of Porus-Krome (100X) showing pores which act as oil reservoirs.



Cross-sectional magnification (100X) of Vanderloy, a pure electrolytic iron which bonds atomically with the base metal of the part being resized to standard.



stance would it be advisable to use liners that were structurally weaker than those designed by the engine manufacturer. On the other hand, it would not be necessary to use an iron that was especially alloyed to resist wear since the Porus-Krome surface is more resistant to wear than any other metal available for cylinder manufacture.

Q: Is copper plated on the base metal prior to the application of Porus-Krome?

A: No. Porus-Krome actually bonds atomically with the base metal.

Q: Is old plate removed from the bores of cylinders that have previously been Porus-Krome plated, i.e., prior to a second re-standardizing?

A: Yes. All traces of Porus-Krome that remain on the bore of a previously plated cylinder are removed. The etching process that removes the Porus-Krome also removes impurities that have lodged in the base metal that has been exposed by wear.

Q: At the plane of adhesion, do the plated and parent metals become as one?

A: In describing the type of bond that is effected by electroplating, cohesion rather than adhesion describes the condition that exists. Electroplating effects an interlocking of atomic structure between the base and plated metal. This type of bonding is in contrast with the mechanical interlocking effected by surface roughening.

There they are—the most frequently asked questions of industry—and Van der Horst's answers.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 86 to check them.

1. An engine gets a periodic overhaul after good service. Although liners are worn, the decision is not to replace them. As to piston rings, would you—
   a. use a new set of the original type?
   b. consider a set using different types?

2. Lube oil consumption can be reduced by selection of ring types to the point where it becomes uneconomic.
   a. True b. False

3. Military specifications for winterized 60-kw generator sets call for an ability to start in temperatures as low as —65°F. Some provision for heating the fuel is needed to
   a. lower the viscosity.
   b. add heat to the cylinder.
   c. keep any waxes present in liquid form.

4. A low-tension magneto, as used on natural gas engines, delivers a low-voltage impulse to the spark plug.
   a. True b. False

5. The reason for the concentrically-fluted surface of a spark plug insulator is—
   a. a matter of appearance.
   b. to increase the flash-over distance.
   c. to improve the insulator's strength.

6. DC voltage, rectified from a 3-phase source, is better for ignition purposes than when rectified from one or two phases because it is
   a. higher. b. lower.
   c. steadier.

7. One reason for electrolysis of piping in plants using natural gas engines with electrical ignition systems is the fact that the primary of the ignition system is grounded.
   a. True b. False

8. What is the accepted maximum thickness of chrome plating that can be applied to cylinder liner bores?
   a. 0.010 in c. 0.030 in
   b. 0.020 in d. 0.040 in

9. Providing an air cleaner is big enough, its size does not affect its cleaning efficiency.
   a. True b. False

First diesel-powered trip down Madison Hill. Grade can be seen at rear of train and also above.

Madison Hill Dieselized

Diesels have recently been assigned to Madison Hill in Indiana, the steepest grade on any railroad in the United States and possibly in the world.

DIESEL-ELECTRIC locomotives have been placed in service on America's steepest grade—the Pennsylvania Railroad's Madison Hill. One of the earliest rail lines west of Allegheny mountains, it was originally chartered as The Madison and Indianapolis Rail Road.

This 5.89-per cent grade, 7012 feet in length, extends upward and northward from Madison to North Madison. It is located at the south end of a 45-mi branch line connecting with the PRR's Louisville—Indianapolis line at Columbus, Ind. Work on this grade dates from 1832. At that time, before the days of modern largescale equipment, cuts were made through solid rock by hand. Some of the cuts are 100-ft deep.

At first horses were used on Hill, but in 1848 they were replaced by a steam locomotive which had a cog wheel running in a rack rail. In 1868 the now famed "Reuben Wells" steam locomotive which ran on smooth rails was placed in service. Subsequently, several steam locomotives of special design were used here, but in recent years specially equipped standard steam locomotives have done the work.

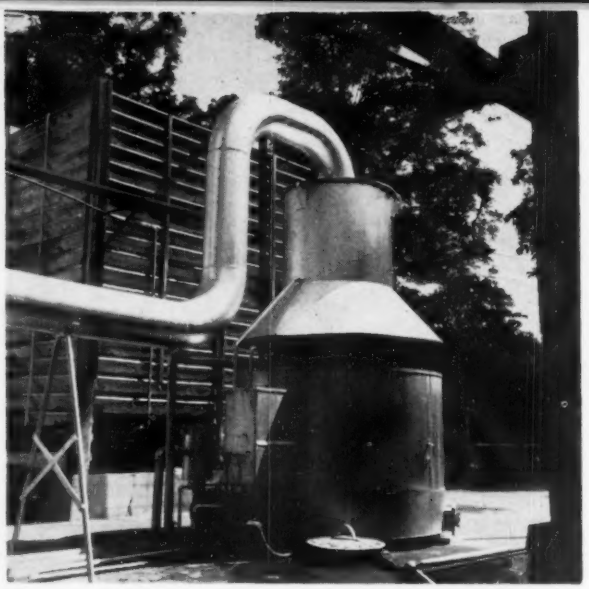
Now one of two special duty 1500-hp diesel-electric locomotives of the road switcher type, equipped with 6-wheel 3-motor trucks, operate on the Hill. They have a total weight of approximately 360,000 pounds on the 12 wheels. These new units, designed so weight is added for additional adhesion, are said to have one of the highest tractive effort ratings in railroad service.

Special equipment on these units includes a special pushbutton-operated device commonly known as the "Hump Speed Control" which provides for instant and exceptionally powerful pulling effort; a wheel slip control which also actuates an automatic sanding device; a new rail cleaning device designed by Pennsylvania motive power engineers and being used for the first time; and dynamic brakes utilizing all six traction motors.

Operation on the Hill is for freight service only as passenger trains on this branch were discontinued in 1931. Standard procedure calls for the locomotive to always be operated on downhill end of the cars being handled.

Load rating for the diesel is 700 gross tons downhill and 350 gross tons upgrade as compared with 200 tons upgrade handled by the replaced steam locomotive. The steam locomotive was of lesser capacity, with 226,960 pounds on drivers as compared with the 360,000 pounds on diesel drivers.

A new oil-bath air cleaner applies a principle that is also adaptable for evaporative cooling of scavenging air. Two identical units, one using oil for cleaning and one water for cooling, can be teamed for scavenging air conditioning.



A 3-stage Cycoil unit of the type used with aftercoolers. Intake air is first cooled in the lower portion of the unit, then cleaned in the upper section.

Conditioning Scavenging Air

MODERN engines with their higher specific outputs and higher rotative speeds are breathing more and more air. Trends toward the increased use of turbochargers and pressure blowers are also boosting the amounts of scavenging air used. This all adds to the dirt load on the air cleaner. Even though there is no increase in dirt concentration per cubic foot of air, more cubic feet are passing through the cleaner and so it has to be.

This places a premium on cleaner efficiency because even though only a very small percentage of fine materials may get through the cleaner, the total dirt to the engine will increase in proportion to the rise in volume of air. Also, the close fits of today's engines tend to reduce their tolerance to dirt. You have to keep the dirt out and yet you don't want a dense filtering media. This only means high resistance and consequently high pumping losses.

From the size viewpoint, you don't want too large a unit not only because of space limitations and cost, but because with the reduced velocity of the air flow, filtration will generally suffer. On the other hand, you want a unit big enough to give good dirt-holding capacity so that you get a reasonable spaceout between servicing periods. Also, efficiency may drop off as the cleaner becomes loaded and the resistance to flow is bound to increase.

Oils and oil compounds are nothing new to air cleaner technology. They have been the mainstay of viscious impingement-type filters and oil-bath cleaners for years. The big trick has been to find better ways to utilize the oil and come up with a better solution to the contradictory engineering requirements for efficient air cleaners.

American Air Filter's research and engineering has come up with a new idea for the handling of the scavenging air problem. It has double-barreled implications concerning both air cleaning and cooling. First, let's talk about air cleaning.

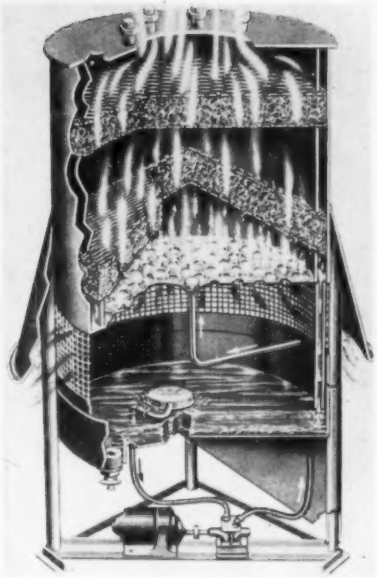
Perforated Entrainment Plate Principle

This title tells the basic difference between the new "P" and "PV" types and the familiar Type "W" *Cycoil* cleaners. A look at the phantom view will show the general configuration of the new unit. Air must pass through the calibrated perforations of the plate upon entering. This plate is flooded with oil by a centrally-located distributing head. The metering orifices increase the air flow velocity, and in passage the air entrains the oil that tends to flow over the edges of the perforations. The plate design also distributes the air flow evenly over the entire area.

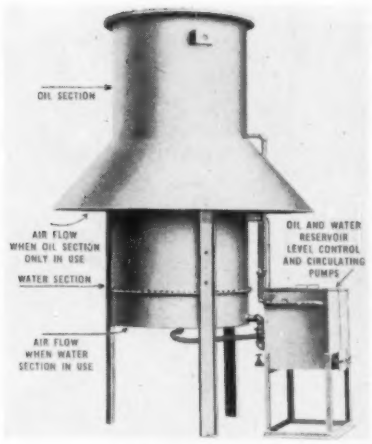
Above the plate is a conically-shaped filter. The entrained oil will have wetted the dust particles and as the air flows through the filter the oil droplets and adhering dust impinge on the filtering media and are removed from the air stream. The shape of the filter encourages migration of the oil to its outer edges and away from the air stream. Passage is provided for return of the dirty oil to the sump. The filter is kept clean by the continual washing action as the oil drains to the edges. Any oil mist that manages to get through the conical filter is caught in a secondary panel filter above. This is the final action and the oil-washed air enters the induction piping.

A variation of this model but with no change in principle is presented in the "P-V" type unit. It was mentioned earlier that cleaner oversize would affect efficiency. In this case, low velocities might not provide good oil entrainment. The cleaner might be properly sized for full engine ratings, but when engine speeds drop and air requirements go down, the effect is the same as for an oversize cleaner. This situation was met by the use of hinged valves to cover the plate openings. The air flow actuates these and the effect is to maintain a constant ratio of orifice opening to air velocity.

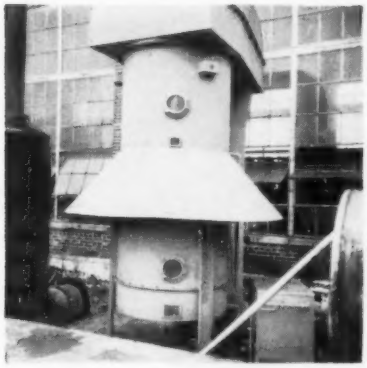
By this control of air velocity, positive oil entrainment is assured. This means that the efficiency of cleaning will



Principle of the perforated entrainment plate-type. This is also adaptable for cooling by substituting water for oil as shown below.


OIL SECTION
AIR FLOW WHEN OIL SECTION ONLY IN USE
WATER SECTION
AIR FLOW WHEN WATER SECTION IN USE
OIL AND WATER RESERVOIR LEVEL CONTROL AND CIRCULATING PUMPS

Combination oil bath cleaner and cooler. This type employs two of the units shown at top of page, mounted one above the other, one for oil and one for water.



With the combination cooling and cleaning unit, the lower portion may be cut out when ambient air temperatures indicate that cooling is not necessary.

be sustained over a wide range of air flows from full capacity of the unit down to approximately 10 per cent of the rating.

Down at the bottom of these cleaners there is a sump for the oil and dirt. The heavy dirt particles will settle out as sludge. Oil is taken from the top through a screened pickup and pumped by a small motor-driven pump to the distributing head. This circulating system provides a continual supply of oil for entrainment in the air. When the sump must be cleaned, the process is simplified by a hinged arrangement for swinging the oil reservoir clear of the casing.

Air Cooler

The second "barrel" of the new design applies the same principle to create an evaporative cooler for the scavenging air. The advantages of providing a denser, cooler charge of air for the engine cylinders have been amply demonstrated. More oxygen is available for combustion and lowering the charge temperature before compression lowers the mean cycle temperature of the engine. The principle is helpful in the control of detonation in high-compression gas engines and in general permits higher bmep's with about the same mean cycle temperature.

The evaporative cooler unit is identical to the cleaning unit. Instead of pumping oil to the perforated plate, water is the medium used. The heat required for evaporation of the water is supplied from the air, thereby cooling it. A *Cycoil-Koolair* combination will consist of two identical units, one above the other, operating in series. The lower unit is flooded with water for cooling and the upper flooded with oil for cleaning.

Still another arrangement has been worked out for use with engines equipped with aftercoolers. The incoming air is passed through water sprays before entering the cleaner.

General

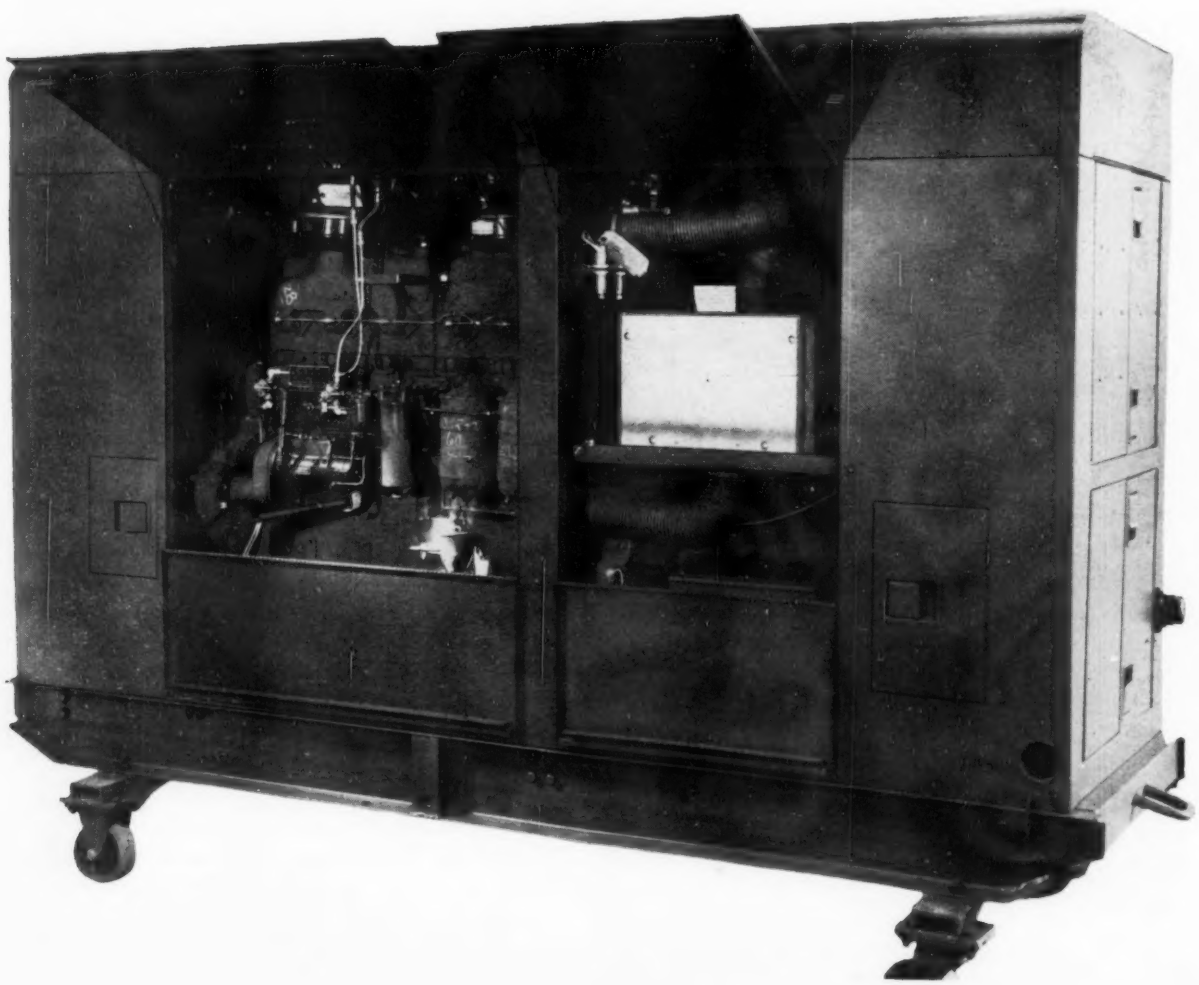
Getting back to fundamentals, it can be seen that these new units were developed with today's requirements in mind. Filtering efficiency is sustained for long periods of time by the self-cleaning action of the filtering media. Servicing periods will of course depend on the local airborne dirt conditions, but it can be seen that the reservoir has good dirt-holding capacity. Cleaning is facilitated by the swing-out arrangement of the reservoir.

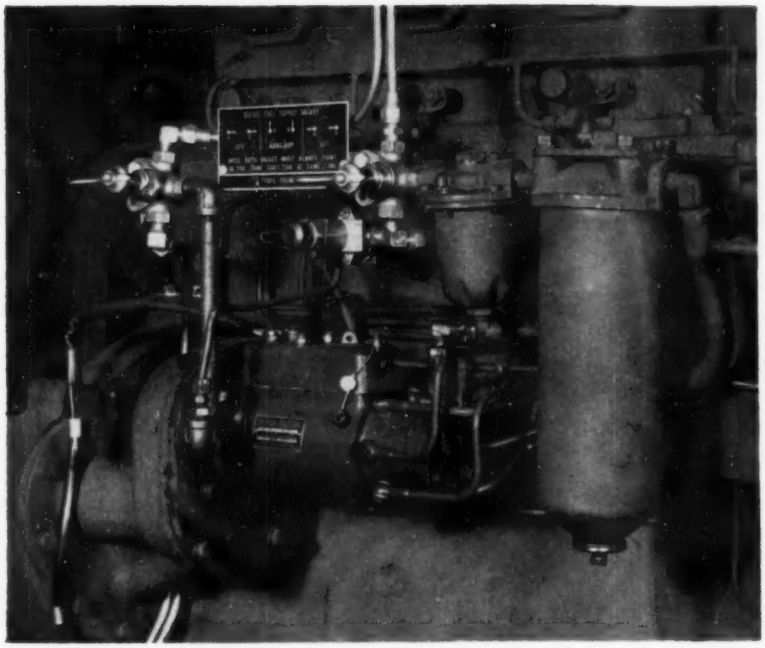
Proper sizing is available for air flows between 1100 cfm and 21,000 cfm by selection from eight sizes. The Type "P-V" with its *Vari-flow* valves lowers the minimum capacity still further. References here are to the Type "P" units. Overall resistances vary from 0.85-in wg for the minimum capacity of the smallest size to 4.0-in wg for the maximum capacity of the largest.

The idea of both cleaning and cooling the scavenging air in a self-contained compact unit is further recognition of today's needs. It typifies the efforts of all segments of our industry to produce products that will improve engine operation and service life.

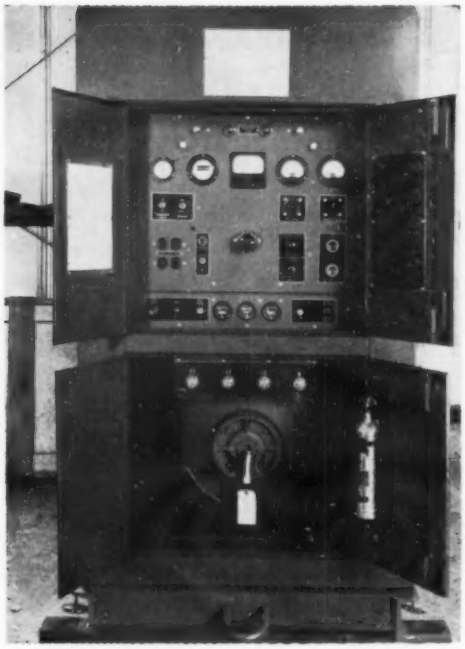
Engineer Corps Gets 961 Generator Sets

Complex military needs demand many special features in their diesel generator sets. Some details of the portable generator sets provided under what is believed to be the largest single order for such units—961 of them—shows how the manufacturer filled the bill.





As will be noted from the illustration, fuel supply is arranged to permit fuel to be taken directly from an outside supply such as a tank or drum, in addition to the fuel tank on the set.



All controls necessary for the control of engine operation and generator output are conveniently grouped on the panel board.

AWARD of a contract by the Corps of Engineers for 961 portable, 60-kw diesel generator sets was made some months ago to the International Fermont Machinery Company. This is reportedly the largest single order for generating sets of this type. The skid-mounted units, fully winterized, are being put together at this time.

There's a lot of difference in military and commercial requirements in this sort of equipment. In commercial application you generally have a pretty good idea of what you will need and plan accordingly. The military are faced with the prospect of using the equipment anywhere on the globe. The sets can be working at the temperatures where brass monkeys suffer terribly or at the other end of the scale. They must be able to team up with various other sets and make power for equipment needing various voltages and frequencies. They must be simple to operate and maintain, while rugged enough to take the abuse of military service.

You design military sets to fit specifications—in this case, MIL-G-10327A. Certain characteristics are spelled out—dimensions, weights, capacities, voltages, frequencies, etc.—while others are specified by performance. All in all, there isn't much room to horse around; you have to use ingenuity and sound engineering to come out even.

"The generator sets shall consist of . . ."

The prime mover, generator, all accessory controls, and fuel storage tanks are all enclosed in a weather-resistant housing. All this is assembled on a rigid mounting skid. The whole structure is strong enough to be skidded over rough terrain without damage. One spec, incidentally, requires that the set must work with the base 15 deg off level. Rings are welded to the skid for towing, and the structural members run up to a lifting eye above the center of gravity of the unit.

Power is supplied by a Buda Model 6DC-844 diesel engine. This is a 6-cyl, naturally aspirated, 4-cycle engine with a 5¼-in bore and 6½-in stroke. Rating is 138 hp at 1200 rpm and 118 hp at 1000 rpm. This particular engine has had previous military acceptance for similar service and therefore was not subject to the pre-production tests required to insure compliance with covering specifications. It had qualified in endurance tests and other requirements.

Some of the tests required are: maintenance of rated output for 1500 hours; operation in accordance with performance requirements at any continuous load up to full rating at any of these conditions: (a) 5000-ft elevation at an ambient temperature of 107°F, (b) 85 per cent relative humidity at 85°F, (c) and must start at temperatures down to -65°F with operation also up to 125°F. There'll be more about item (c) later.

The Delco Products Model I4347 AC generator is also an accepted product. It is a 3-phase, 6-pole machine with damper windings to facilitate parallel operation. It is "wye"-connected and will give 120/208- or 240/416-volt operation at either 50 or 60 cycles. Twelve stator wires terminate on a reconnection board where necessary changes can be made. For 50 cycles, engine rpm is 1000; for 60 cycles, 1200 rpm. Power factor is 0.8. A 90-volt, 2-kw DC generator is directly driven to provide excitation.

A flange on the generator bolts directly to the standard SAE flywheel housing of the engine. The generator has its own bearings and is driven through a flexible torsion plate bolted to the engine flywheel. The combined engine and generator form a rigid unit and minimizes any possibility of misalignment from rough handling, etc. Also, being bolted to the skid at the front of the engine and at the generator, it contributes to the overall rigidity of the set.

". . . shall start at minus 65°F . . ."

Housing design permits easy removal if desired, and includes access doors, ventilation ports, etc., for normal operation. It's a good, tight job designed to exclude wind-driven snow, rain, or dust. Starting at -65°F is something else again and requires special provisions.

External heat in the form of hot air is supplied by a Perfection Stove gasoline-burning unit. There are three paths so that heated air can flow to all vital elements. One branch goes downward to a stainless steel shroud around the sump in the oil pan. Another is connected to the oil pan inlet neck, and a third heats the battery box (over the generator) and then discharges back to the engine compartment directly in line with the rearmost of the two scavenging air cleaners.

The designer, David Rohr, favors the hot air in preference to coolant heating. The air, circulating within the housing, soon gets quite hot and permeates all parts of the engine where it heats critical surfaces directly. Cylinder walls, pistons, valve chambers, the fuel injection system, filters, and the lube oil, are all heated. In addition, the 55-gal fuel tanks, hung just under the housing roof, warm up. This can be important in cold weather if there is wax present in the fuel. Heating will keep the wax liquid and prevent filter plugging and inadequate fuel supply.

Flexible tubing of a silicone material is used as air ducting. Its pliability permits easy connection and disconnection of the tube leading to the lube oil filler neck. A 3-way switch—high, low, and off—with an associated pilot light, mounts on the control panel. In the "high" position, the heater's capacity is 20,000 Btu per hr and 16,000 when at "low" position. A thermostat in the battery box shuts down the heat if the temperature of the electrolyte exceeds 120°F.

Four 120-amp hr batteries in series provide starting power. The cranking motor is a Leece-Neville unit with a Bendix drive. The designer expressed a preference for this drive with the contention that with the rotor turning, the impact of engagement was helpful in overcoming break-away torque. Good success was reported in earlier and similar applications.

As a further starting aid, two Chevron priming units are used. Each feeds the ether compound into three intake manifold elbows. Better distribution to all cylinders is claimed for this individual-cylinder induction system.

Cooling is controlled by radiator shutters actuated by a Detroit Lubricator thermostatic element at the bottom of the radiator. In addition, there is an overriding manual control. An engine thermostat bypasses the radiator during starting and periods of overcooling. A pusher-type fan pulls air through the housing vents and pushes it through the Young radiator. Flow must be good because it was necessary to baffle the front valve cover vent to prevent oil pull-over.

". . . control devices shall be . . ."

Protection is afforded to the set by high water temperature, low oil pressure, and overspeed cutoffs. Engine operation is monitored by the normal complement of gauges. An elapsed-time meter keeps track of engine operating hours to facilitate maintenance scheduling.

Electrical instruments are complete down to the ammeter for the battery-charging generator. In addition to the ammeter and voltmeter for the main generator, there is a frequency meter and a kilowatt meter. Both automatic and manual voltage regulation are incorporated, with selection and adjustments made on the panel. A switch for single-parallel operation and the synchronizing switch and lights take care of parallel operation.

One of the purposes of these controls when coupled with the main components is to produce the specified operational stability requirements. There is no question of meeting the rated load and normal overloads; that has been proven. Also, electrical components meet the requirements once the controls are properly set. Frequency control and voltage fluctuations with load changes will largely depend on governor and engine response. These engines use the RoosaMaster fuel injection pump with an integral governor and solenoid shut-off.

Speed is regulated by turning a threaded throttle control capable of very close adjustment. A central button disengages the threads to permit a crash stop. Once set, the governor will hold frequency constant within the close prescribed limitations (1/3 of 1 per cent of rated speed). With sudden load changes, four seconds are allowed for recovery and the allowable speed change is 6 per cent decrease and 8 per cent increase. Recovery in 1½ seconds is easily achieved after changes from no-load to full-load and vice versa, and well within the permissible swing.

"Tests shall be conducted . . ."

Elaborate test requirements must be met by each set upon completion. Rated load, voltage and speed regulation, stability and transient response, calibration and functioning of various components are checked. They must all meet specification.

That's not all. Everything must be there from the stainless steel muffler that mounts on the roof to the fire extinguisher in the space below the panel board. Finally, there is processing and packing, all spelled out for compliance. When finished, there is a dependable, versatile generator set ready for use anywhere on the globe where GI's need power.

news of our industry

Cummins Production Line

Opening of the new 300-ft conveyorized production line at Cummins Engine Company, Inc., Columbus, Indiana, signalled the completion of the building portion of the company's $7,000,000 post-war expansion program. This modern assembly line is housed in a completely air conditioned, dust-proof structure.

Cummins diesels come down the moving line, carefully assembled under strict quality-control measures. In order to insure the smooth flow of components to the production line, machinery layout throughout the plant was rearranged and many semi-automatic tools were replaced by new high efficiency automatic equipment.

Steam to Diesel

A little over a year ago, the Amalgamated Sugar Company of Twin Fall, Idaho converted its steam-powered locomotive crane to diesel power. The crane, a 1917 Orton, is used for materials handling and general construction work. Recent figures compiled by the company indicate the various advantages which have resulted from the changeover.

After a year's experience with diesel power in the unit, Stanley Brown, a master mechanic for the sugar company, reports a smoother, faster and more economical operation, and that the crane now requires one less man to operate.

According to Mr. Brown, the specific advantages which have resulted are reflected in less wear and tear on the crane's mechanism, a substantial increase in work done per day, and a saving of $100 per 5-day week in fuel costs alone.

The $2500 yearly maintenance cost on the boiler has been eliminated as has the downtime required to clean the boiler twice a week. Also done away with is the daily hostling previously required.

The changeover, supervised by Mr. Brown, took only 55 man-hr to complete. The new power plant is a 4-cyl, GM Series 71 diesel with a GM torque converter supplied by Southern Idaho Equipment Company of Boise. Although diesel power was not being installed in Orton cranes when this unit was built, the Orton Company today offers this diesel and the GM 6-cyl Series 71 torque converter unit in many of its current models.

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New No. 147
INDUSTRIAL

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STITT

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For 36 years, Stitt has engineered and manufactured heavy-duty industrial type spark plugs exclusively. In service, Stitt plugs deliver up to 10 times ordinary plug life, even under the most adverse conditions. Give them a test in your costly industrial engines.

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Laboratory and field tests prove for Stitt 147's outstanding performance in these and similar heavy-duty engines:

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WRITE for catalog, price list and conversion charts, and actual facsimilies of field performance test reports on Stitt Spark Plugs.

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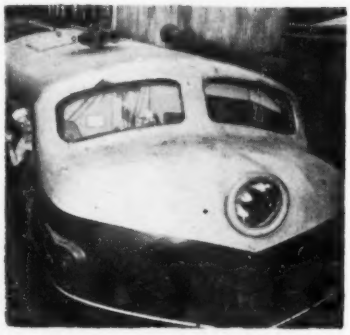
news of our industry



Whistles for the B&O

"Railroad Getting High Falutin'; Using Chimes Instead of Tootin' ", is the reproduction of a newspaper story headline leading off an article in the *Baltimore & Ohio Magazine.* The railroad's new chime whistle has been attracting a lot of attention throughout the land.

For the past five years, the line's Motive Power and Equipment Dept. has been carrying on a research and testing program designed to improve the sound of the diesel horn. Along with its principal function as a warning device, the sounder must also serve as a means of communication among crew members. In addition, it must have a distinctive tone, employ good carrying power, and at the same time be inoffensive to people living along the right-of-way.

Scores of letters have been written to the B&O, expressing nostalgic emotions about the passing of the old steam whistle when diesel became king. B&O thinks it has solved the problem, developing a whistle that is both practical and melodic.

Working with the Nathan Mfg. Co., it produced a 5-chime whistle which is now standard on all its diesel-electric passenger trains. The five bells are arranged in staggered manner, two pointing to the rear of the locomotive and three to the front. A 3-chimer has been adapted for large freight locomotives and 2-chimers for service on switchers.

Not to be outdone, other railroads in the nation have been experimenting with whistles. According to the National Geographic Society, more than 9000 diesel locomotives have had their horns supplanted.

Some dozen major railroads have taken up a new whistle using compressed air on a metal, plastic, or rubber diaphragm, which makes possible the blending of vibrations into one tone that can be heard five miles away. Canada was the first to experiment with this type of whistle.

One U. S. road carried on 200 tests before it finally had to call on the Navy band for help. The musicians responded by blending C sharp, E, G, and A at different frequencies to produce a soothing major chord.

Whistle intensities are now controllable. A low, organic peal may be used for the small hours of the night or an ear-splitting blast during the day. So much for nostalgia!

Diesel Pumps to Israel

The first two complete units of a $2,100,000 purchase of heavy-duty water pumping equipment manufactured by Worthington Corp. for use in a major irrigation project in Israel, was recently shipped from New York City. The total purchase consists of nine centrifugal pumps and nine diesel engines, together with their gears and auxiliary equipment. The machinery is consigned to the Mekorot Water Company, a public agency engaged in development of water resources.

The contract with Worthington was signed in July 1952. The equipment will be installed in three pumping stations to carry water from the Yarkon River, near the Mediterranean coast, southward to the Negev, a distance of some 43 miles. It will supply water for irrigation and other purposes to existing agricultural settlements and will make possible the establishment of new settlements in the arid Negev region. Irrigation of this area, a top priority project of the Israel government, will increase the country's arable land area by 35 per cent.

Three pumps, each driven by a 2000-hp, 8-cyl diesel engine, will be installed in each station. Total capacity of the entire system will be 135,220 gpm. The water will be carried through 66-in pipe manufactured at the Israel plant of the Lock-joint Pipe Co. of Ampere, N. J.

news of our industry

JCL Passengers Dieselized

Jersey Central Lines announces that all major changes necessary to put its new and faster passenger train schedule into effect on its main line have been completed, including receipt of seven huge 2400-hp diesel-electric F-M Trainmaster locomotives and final touches in connection with new interchange facilities at Elizabethport.

Four new self-propelled Budd cars have been received, completely dieselizing passenger service on the road. Two-way signaling work on an additional track between Jersey City and Bayonne has been completed for increased operating flexibility and platform lengths have been increased where feasible to accommodate the longer trains. Until the seven new Trainmasters were received, two smaller diesels were used to "double-head" the longer trains.

Used Equipment Program

Caterpillar Tractor Co. has launched a promotional program for its domestic dealers designed to give assurance of quality and long service to purchasers of used Caterpillar equipment. Based on 1953 figures, the company estimates it will result in annual sales of millions of dollars of used equipment.

"Bonded Buy", as the program is called, will assure purchasers that a machine is fully guaranteed against defective parts for 30 days, a guarantee backed by a master bond with an indemnity company. If the dealer fails to fulfill his obligation, the surety company will make good. The bond will also include attachments of any make on the machine at time of purchase.

Two other customer agreements offered are "Certified Buy" and "Buy and Try". Under the first, used machinery not qualifying for "Bonded Buy" support, but carrying the dealer's written guarantee, will be included. The other is a term for on-approval purchases. Machines under these two agreements will not necessarily have to be Caterpillar-built machines.

FH-607-K FLEX-HEAD SET

Snap-on*

Flex-Head Wrenches—
fastest, most versatile wrenches on a wide, wide range of jobs!

● Each socket of a Snap-on Flex-Head pivots through an arc of over 180°. The wrench swings readily over or under an obstruction—easily handles hard-to-get-at nuts, studs, bolts. A friction spring holds the socket at any desired angle, and the chamfered edges of the openings aid in quick placement on the work. With the handle held in a vertical position the nut can be spun rapidly. Flexing the handle over provides maximum leverage for tightening or breaking loose.

Snap-on Flex-Head wrenches are widely used for assembly and maintenance operations . . . real time savers for such service as locking and unlocking milling machine jigs and tightening flange bolts. The set illustrated provides all wrench sizes from 3/8" to 7/8", with the most widely used sizes duplicated in different handles. Available through Snap-on factory branch warehouses in principal industrial centers. For special Industrial catalog and General catalog of 4,000 Snap-on hand and bench tools, write

SNAP-ON TOOLS CORPORATION
8064-F 28th Avenue • Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation.

new products

Portable Compressor—Diesel Powered

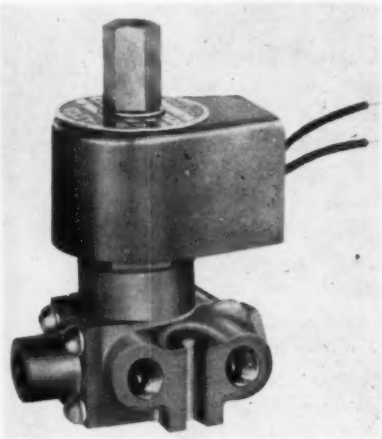
According to a recent announcement of the Hercules Motors Corporation, Canton, Ohio, the Model DFXH Hercules engine now powers the new Davey 600-cfm compressor. This is the largest compressor in the Davey line. The DFXH diesel engine is designed for high-speed, heavy-duty service. It has a bore and stroke of 5¾ in and 6 in respectively, and a piston displacement of 935 cu in. Rated horsepower for the diesel is 260 hp which is developed at 2100 rpm.

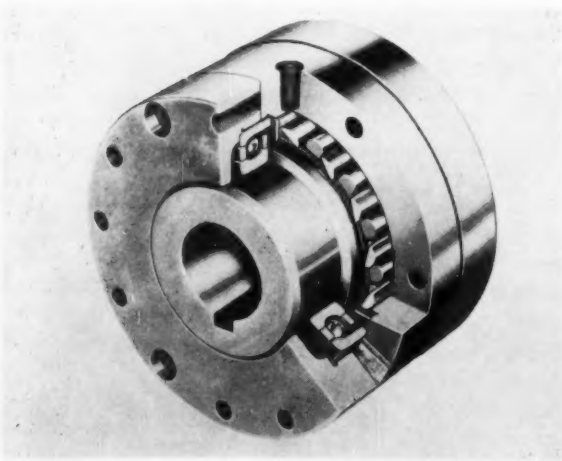
In the accompanying illustration, the 600-cfm diesel-driven compressor is shown furnishing power for two wagon drills of 4-in bore. This is one of several Hercules-powered Davey compressors owned by the H. J. Williams Company of York, Pennsylvania.

Midget Solenoid Valve

A new compact solenoid valve standing only 4 7/16-in high with an overall length under 3 in and a depth of 2 in., is now being marketed by the Automatic Switch Company of Orange, New Jersey.

The 4-way valve is designed for handling air, water, light oil, and other non-corrosive gases and liquids at temperatures up to 212°F. Permissible pressures range from a minimum of 10 lb to a maximum of 125 lb for AC, and up to 50 lb for DC. Detailed information on the midget 4-way solenoid valves is available from the company at Orange, New Jersey.





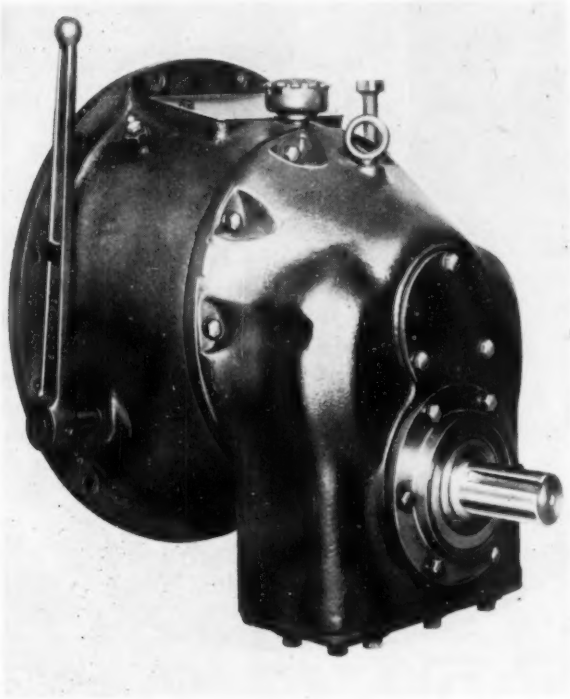
Cam Clutches

A new line of general service, heavy-duty ball bearing overrunning clutches has been added to their line of standard cam clutches by the Morse Chain Company, 7601 Central Avenue, Detroit 10, Michigan. Called the MC Series, these self-contained units include two ball bearings that maintain concentricity of the inner and outer races, thus avoiding the need for additional bearings to support the ends of shafts that the clutches control.

Typical drive applications for the cam clutches, which have alternate low wedge angle cam and roller construction, include high-speed overrunning and backstop as well as heavy-duty indexing. Tapped holes are provided on both ends of the clutches for capscrews or studs which can attach sprockets, pulleys, gears, or ratchet arms for particular drive requirements from 60 to 545 ft lb.

Industrial Reduction Gear

Two new industrial reduction gears with power cut-off clutch for heavy-duty equipment are now in production by the Snow-Nabstedt Gear Corporation, Hamden, Connecticut. Listed as numbers S-N 2225/3025 and S-N 2235/3035, these herringbone reduction gears are especially designed for continuous heavy-duty operation—for transmission of full power from engine to load—with engines ranging in size from 40 hp to 155 hp.



A standard power take-off clutch with gear-tooth drive is used. The clutch is readily adjustable through the hand hole on top of the clutch housing. All gears and bearings are splash-lubricated. Standard reduction ratios from 1.5:1 to 3.0:1 are available in both engine and anti-engine rotations. Stub shaft or flanged coupling is optional at no extra cost. Literature is available upon request.

Vacuum Cleaner

A 5-hp portable vacuum cleaner, designed to operate two 50-ft, 1½-in hoses or one 75-ft length of 1½-in hose has just been introduced by U. S. Hoffman Machinery Corp., Air Appliance Div. The unit has a large dust bucket and is equipped with an exhauster and motor which produce 6.5-in hg suction. The machine is recommended as a general housekeeping tool to keep floors, walls, lights, and other dust-catchers around the plant, spruce and clean. It is designed to fill a specific need in industry for a high-vacuum, low-cost cleaner. Detailed information is available upon request from the company at 105 Fourth Avenue, New York, N. Y.

BIG NEWS
FOR ALL DIESELS!

FRAM completely removes water from diesel fuel with NEW WATER SEPARATOR & FUEL FILTER

✓100% Water Removal! ✓Traps Dirt and Dust!
✓Cuts injector maintenance costs!
✓Reduces down-time!

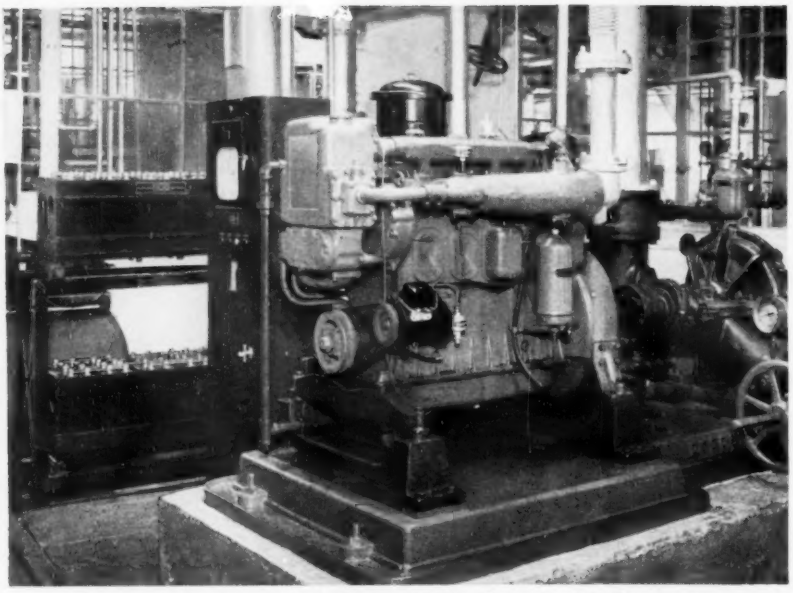
The new FRAM Water Separator & Fuel Filter is a double-action filter for complete injection system protection—

1. Saves costly injectors from corrosion, rusting and pitting . . . removes all water!
2. Micronic filtration traps dangerous dirt before it reaches injectors . . . ends abrasive action!

Save the cost of replacing expensive injectors! Guard your diesels for longer life . . . less wear . . . fewer repairs—with the new FRAM Water Separator & Fuel Filter! For specific installation information write: FRAM CORPORATION, Providence 16, R. I. Fram Canada Ltd., Stratford, Ont.

IMPORTANT!
Diesels already equipped with FRAM Fuel Filter need only the Water Separator Filter and a new FRAM Coalescer Cartridge for 100% water removal!

FRAM
OIL • AIR • FUEL • WATER
FILTERS



They watch together. The Nicad battery (*left*) will provide this Diesel engine with a surge of starting power on a split-second's notice in case of alarm.

Fire warden all ready to jump

It may be 5 minutes from now or never when this battery is called into action. But because it is a Nicad it will spring into service the split-second the fire signal is given. It will start this Diesel fire pump for emergency water supply.

The Nicad battery has the exact characteristics such trigger-action service requires. It will stand by for years without deterioration, it accepts a trickle charge and it is easy to maintain. The nickel cadmium battery has long been preferred in Europe for services vital to life and property, and was first made in America by Nicad.

Nicad batteries and Diesel engines pair perfectly. Nicad offers lowest over-all costs. Data available.

NICAD

The Battery with the Steel Constitution

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Please send me authoritative data on Nicad batteries. We are interested in the fields checked below.

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Name.....

Function.....

Company.....

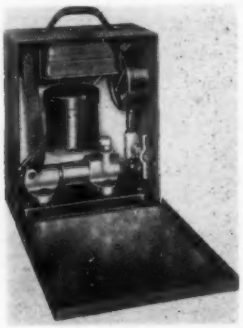
No. and St.....

City.....Zone.....State.....

new products

Portable Nozzle Maintainer

American Bosch Corp., Springfield 7, Mass., is making available a new



portable nozzle cleaning and testing outfit so that diesel injection spray nozzles may be tested and cleaned right on the job.

The outfit consists of a compact metal carrying case containing both nozzle test stand and nozzle cleaning kit. The nozzle test incorporates a fuel injection pump to make sure nozzles being tested are subjected to approximately the same hydraulic conditions as are encountered on an engine. A filter is included to protect nozzles from being accidentally injured by dirt. A pressure gauge reading to 5000 psi facilitates setting of opening pressures. The tester is suitable for nozzles of the American Bosch R, S, and T sizes.

New Sight Glass Fluid

A new fluorochemical liquid for use in sight glasses of force feed lubricators, claimed to have long life and to be non-cloud forming on the glass surface, has been announced by Minnesota Mining and Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

Called Fluorochemical 101, the new fluid is said to be completely inert and therefore will not extract additives used in lubricating oils. The liquid is also colorless, odorless, nonflammable and non-toxic. As a result, use of this product in place of conventional glycerine or glycerine-water mixtures is said to eliminate the periodic removal of sight glasses for cleaning. It is available in half-pint, pint, quart and gallon quantities, an 8-oz bottle filling 10 lubricators of medium size.

new products

Low Charge Rate Ammeter

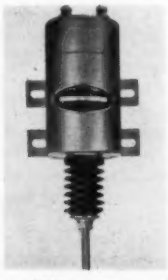
A new ammeter especially designed to indicate low battery charging rates has been announced by Rochester Mfg. Co., 100 Rockwood St., Rochester 10, N. Y. Designated Model 4015-C43, the instrument gives readings through a design that provides unit values on the charge side which are only half those on the discharge side.

By means of this design, the charging current causes twice the pointer movement that the same current gives on the discharge side. The operator therefore can note currents as low as 1 or 2 amps, and the needle will not be on zero when any charge is taking place. The ammeter is being made to meet this special requirement of heavy-duty equipment such as farm tractors and road graders, stationary engines and other units that are normally operated continuously for long periods of time.

Continuous-Duty Solenoid

Synchro-Start Products, Inc., Skokie, Ill., announces the addition of a new continuous-duty solenoid to its line of standard automatic and semi-automatic engine controls, developed to meet heavy-duty requirements.

Fully enclosed in a sealed cage to protect it from dust and liquid infiltration, the unit, Model SD, is said to have an exceptional amount of power over a long stroke. It can be furnished in all standard and special voltages up to 115-v DC and has a 10-lb over a 1½-in stroke. Power consumption is 550 watts pulling and 8 watts holding. It is available with standard terminal screws or standard



aircraft-type AN connector. In private tests by the company, 80,000 cycles were run without failure and no appreciable wear.

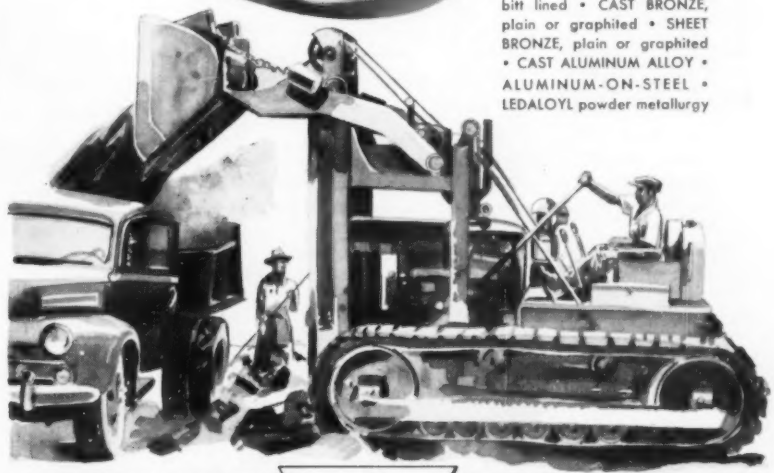
HEAVY DUTY
DIESELS REQUIRE
Rugged
BEARINGS

JOHNSON ALUMINUM ON STEEL

■ Here are sleeve bearings which will easily handle loads up to 5000 P.S.I. Johnson Aluminum-on-Steel Bearings are built for diesels requiring heavy duty service, high speeds, and heavy loads. In this service, diesel manufacturers report exceptionally satisfactory performance, much better than with other bearing types. Month after month they are becoming more generally recognized as the preferred bearings in many diesel engines . . . . . .

JOHNSON BRONZE COMPANY
470 South Mill Street, New Castle, Pa.

JOHNSON BRONZE PRODUCES ALL TYPES OF SLEEVE BEARINGS:
BRONZE-ON-STEEL, copper lead • STEEL BACK, babbitt lined • BRONZE BACK, babbitt lined • CAST BRONZE, plain or graphited • SHEET BRONZE, plain or graphited • CAST ALUMINUM ALLOY • ALUMINUM-ON-STEEL • LEDALOYL powder metallurgy



JOHNSON B BEARINGS
Sleeve-Type
WRITE FOR INFORMATION

new literature

Storage Battery Maintenance

Publication of an 8-page pocket-size booklet on storage battery maintenance has been announced by Exide Industrial Div., The Electric Storage Battery Co., Box 8100, Philadelphia 1, Pa. Battery care is broken down into seven basic rules, each emphasized with cartoon treatment and minimum explanatory text.

Copies of the booklet may be obtained by specifying Form 5063.

Quick-Seal Hose Coupling

A quick connect-disconnect hose coupling, said to provide permanent freedom from leakage, is described in a bulletin issued by Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

Construction of the coupling is detailed. Also described are single- and double-check valve modifications of the coupling, and accessories such as right-angle connections.

Protection of Distilled Water

Barnstead Still & Sterilizer Co., Lanesville Terr., Forest Hills, Boston 31, Mass., has a bulletin ready for distribution which describes in detail its new Ventgard, a filtering unit for protecting distilled water in storage from bacteria, dust, mist and gases, including carbon dioxide.

Details of laboratory tests are listed, giving efficiency results with particles as small as 0.2 micron. Application photos show fittings for either pyrex or metal storage tanks.

O-Ring Brochure

Goshen Rubber Co., Inc., Goshen, Ind., has issued a 12-page brochure on O-rings, giving detailed information on compounds, groove dimensions, and sizes. It contains diagrams of typical applications, and is intended to be of help to designers and users of the seals for dynamic and static applications.

Plant Maintenance Report

Available from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., is "Productivity Report—Plant Maintenance", 80 pages with charts and photographs. This is a survey of U. S. industrial plants by a visiting British productivity team, pointing up the close relationship between progressive maintenance practices and high productivity.

The report reviews such practices as the design of plants to include strategic location of lifting and other labor-saving devices, properly placed tracks and runways, and the special design of equipment for ease in handling, servicing, inspection, and replacement.

Emphasis is also placed on maintenance simplification by use of such mobilized equipment as lubrication trucks, straddle trucks, mobile cranes and tool boxes, and motor scooters. Special sections detail technical advances in cost control, instrumentation, personnel management, and the theory of preventive maintenance.

"AMOT" THERMOSTAT

"Performance without trouble" is the reason more engine manufacturers, pipe lines, power plants, oil companies and shipyards are using AMOT as standard for automatic engine water and oil temperature control. AMOT thermostats offer the following advantages:

1. Large capacity combined with light weight.
2. Excellent reliability even under extreme shocks and vibration.
3. No external bulbs or tubing to break and cause trouble.
4. Temperature is fixed and cannot be tampered with by operator.
5. Holds close regulation and is not sensitive to pressure.
6. Operating forces are very large and with no packing glands there is no chance of valve ever sticking or becoming inoperative.
7. Because of its simple and rugged construction, practically no maintenance is ever required.
8. Has positive 3-way valve action in which full pump capacity flows through the engine at all times.
9. Compact in size and will operate in any position, which facilitates piping.
10. Available in pipe sizes up to 6" for all types of gas and diesel engines.

Write for catalog and name of your nearest AMOT representative.

AMOT CONTROLS CORP.

(Formerly American Motors Company)

RICHMOND, CALIFORNIA

58 NOZZLE CLEANING TOOLS

IN 8 POPULAR KIT ASSORTMENTS

for SERVICING ALL COMMONLY USED NOZZLES and INJECTORS

Detailed instructions included with each Kit

Tools may be ordered individually or in combinations to suit specific requirements. For recommendations on special assortments, give make and model of engine and type of fuel injection unit used.

These special-purpose tools are indispensable for performing the factory-recommended cleaning operations for which standard shop equipment is not adequate. Designed to promote safe, fast and efficient cleaning of all commonly used nozzles and injectors, these unique tools enable mechanics—even with limited Diesel experience—to clean Diesel fuel injection units competently to factory-precision standards.

WRITE FOR BULLETIN D631

BACHARACH INDUSTRIAL INSTRUMENT CO.

7301 PENN AVENUE • PITTSBURGH 8, PA.

YOUR OLD INJECTORS REBUILT EQUAL-TO-NEW

GM DIESEL POWER

Series 51-71-110 perfectly restored to original factory specifications by factory authorized source

No reworked, no discarded parts unfit for further use. Through authorized source, you get finest workmanship, fresh-from-factory replacement parts of latest design and greatest efficiency. Investigate this money-saving plan to renew your old injectors.

IF IT COMES FROM GRIFFIN GUARANTEED IT'S GOT TO BE RIGHT

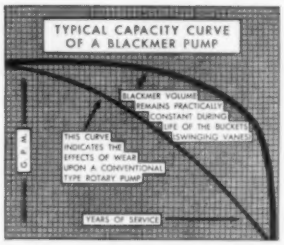
AEI ALLIED EQUIPMENT INDUSTRIES

Headquarters for G.M. Parts & Service

GRIFFIN EQUIPMENT CORP.

880 East 141st Street, New York 54

MElrose 5-7707


TYPICAL CAPACITY CURVE OF A BLACKMER PUMP
BLACKMER VOLUME REMAINS PRACTICALLY CONSTANT DURING LIFE OF THE BUCKETS SWINGING VANES
THIS CURVE INDICATES THE EFFECTS OF WEAR UPON A CONVENTIONAL TYPE ROTARY PUMP
CAPACITY
YEARS OF SERVICE

BLACKMER DESIGN *means low pumping costs . . .*

1. Blackmer's swinging and sliding vane principle assures maximum efficiency, positive priming characteristics, and continuing high rate of delivery. Metallic or composition vanes which are self adjusting for wear insure peak performance through years of hard use. When the vanes finally wear, it is easy to replace them and restore the pump to normal capacity in a matter of minutes.
2. The Blackmer design also features replaceable cylinder liners enabling pumps operating under severe conditions or corrosion and abrasives to be renewed at minimum cost.
3. Proper shaft alignment and easy maintenance result from the use of heavy duty bearings which are isolated from the pumpage.
4. The Blackmer pressure control valve, an integral part of the pump, provides minimum variation from set pressure and protects the unit against damage by accidental shut-offs in the discharge system.
5. Pumps are available with speed reduction equipment for operation by all types of power drives (Motors, Engines, Turbines, etc.)
6. Blackmer rotary pumps supply the answer to a wide range of LIQUID MATERIALS HANDLING problems involving delivery to 1500 GPM — viscosities through 100,000 SSU — discharge pressures through 150 PSI — temperatures to 600°F.

BLACKMER 50th *liquid materials handling*

BLACKMER

Industrial, Hand and Truck Pumps, Strainers, Pressure Control Valves

BLACKMER PUMP COMPANY, GRAND RAPIDS 9, MICH.

DIVISION SALES OFFICES — NEW YORK • ATLANTA • CHICAGO
GRAND RAPIDS • DALLAS • WASHINGTON • SAN FRANCISCO

See Yellow pages for your local sales representative

new literature

Sealing Cracks and Leaks

A 48-page illustrated handbook, detailing methods for a wide range of repair with cements, has been announced by Smooth-On Mfg., Co., 570 Communipaw Ave., Jersey City 4, N. J.

Text and illustrations include repair methods for leaks in pipes, radiators, blocks, and sheet and plate metal. Other sections show how to tighten loose parts in metal, wood, or plastics, and how to use the repair cements to anchor posts, screws, and other grips and supports in masonry. A table lists the physical data of each cement.

Emergency Power Units

How standby power units can prevent loss of time, production, customers, and lives is outlined in a new booklet, "When Power Fails", published by Caterpillar Tractor Co., Peoria 8, Ill.

Pictures and data on various models of the company's units operating over the country are included. Also given is a partial listing of locations where the standbys are used today and a chart showing the range of engine and electric sets manufactured by the company.

Alloy Castings in Industry

For users and potential users of stainless and heat-resistant alloys in cast form, International Nickel Co., Inc., 67 Wall St., New York 5, N. Y., has issued "Heat Resistant and Corrosion Resistant Alloy Castings in Industry", a 48-page booklet. Typical compositions regularly produced, with their applications, limitations, and the types of service for which they are suitable are discussed.

Applications of typical alloys by industry are illustrated in over 175 photographs. Charts compare creep strength of various alloys, resistance to corrosion in certain media, and to oxidation at elevated temperatures. Tables of composition also list principal Alloy Casting Institute designations as well as certain proprietary alloys.

Precision Measuring Tools

George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., has issued a supplement to its literature on precision measuring tools.

The addition illustrates and describes a new model of a vernier caliper with a combination of automatic camlock and fine adjustment screw and long vernier of 6-in measuring capacity. The instrument is convertible into a height gauge by two attachments, base and scriber. Other items detailed include vernier depth gauges and steel squares, both straight and beveled.

Metal Parts Batch Cleaning

In an 8-page bulletin, "Metal Parts Batch Cleaning in Minutes", Magnus Chemical Co., Inc., Garwood, N. J., describes its Aja-Lif cleaning machines.

The new bulletin elaborates on the importance of mechanical agitation in parts cleaning and details features of the machines, along with photographs, operational data, and application specifications.

organizational news

Robertshaw-Fulton Ad Director

George S. Chappars has been appointed to the newly-created post of director of advertising and public relations for Robertshaw-Fulton Controls Co. He will be located in Greensburg, Pa., executive offices of the firm.

Mr. Chappars was formerly associated with Ketchum, MacLeod & Grove, advertising agency, and previous to that was in the advertising department of Armco Steel Corp.

George S. Chappars

Joins Associated Consultants

Associated Consultants, specialists in diesel plant engineering, announce that Don R. Bohannan has joined them as an associate. He has been with the Worthington Corp. for many years.

L-W Appoints Ad Manager

Lloyd A. Rager has been advanced to the post of advertising manager for LeTourneau-Westinghouse Co. to succeed Joe H. Serkowich who has been named to the newly created position of director of advertising and publicity for Westinghouse Air Brake Co., parent organization.

Mr. Rager joined the company 17 years ago. He progressed through successive promotions to head the company's parts catalog department, later becoming assistant advertising manager which position he held four years. Earlier this year he was named sales promotion manager.

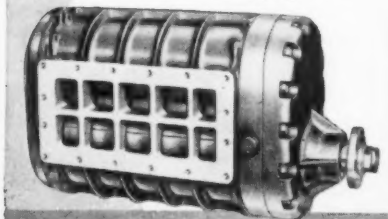
New Briggs Manager

The Briggs Filtration Co. announces the promotion of Willard Eichelberger to manager of its engineering department. Mr. Eichelberger, before this new appointment, was a field engineer. Previous to that he was associated with American Oil Co.

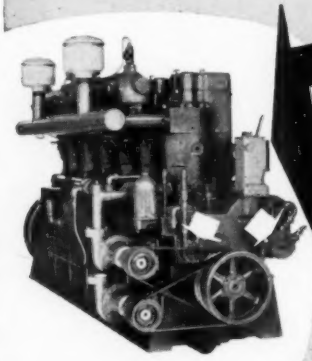
Willard Eichelberger

BOOST HORSEPOWER
50% or more
WITH MIEHLE-DEXTER SUPERCHARGERS

- For Internal Combustion Engines
- Blower and Air Compressor Operations
- 100-750 H.P., 15-4000 cfm., 2-15 psig.



MIEHLE-DEXTER SUPERCHARGER
Division of Dexter Folder Company
100 Fourth Street, Racine, Wisconsin



For POSITIVE LUBRICATION

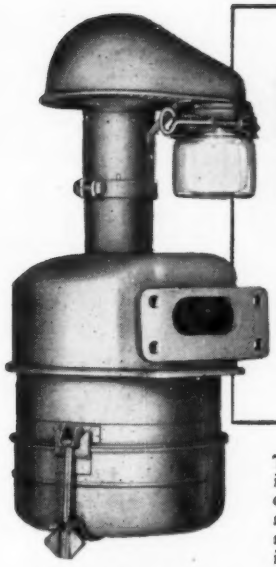
It Pays to Specify
TUTHILL PUMPS

For dependable lubrication of diesel engines and power units, Tuthill offers a complete line of positive displacement pumps, designed for lubricating and scavenging. Included are automatic reversing pumps and stripped models for built-in applications.

Write for the Tuthill Pump Guide listing all Tuthill Pumps for lubricating requirements. Send specifications for quotation.

TUTHILL PUMP COMPANY
Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada



Donaldson
Air Cleaners
are
EASY TO SERVICE!

CUSTOM-BUILT
TO FIT YOUR ENGINE
Write our engineering department for air cleaner recomendations.

The simplicity and speed of servicing Donaldson Air Cleaners encourages regular attention by the machine operator. No tools are needed to remove oil cup. Cleaning cup and re-filling with oil is a two-minute job. Removable tray makes cleaning out chaff, lint, leaves and larger foreign particles simple and fast.

DONALDSON CO. INC.
666 Pelham Blvd., St. Paul 4, Minn.
Grinnell Division: Grinnell, Iowa
Donaldson Company (Canada) Ltd., Chatham, Ontario

Donaldson *Air Cleaners ← Mufflers*

KIENE®
DIESEL INDICATOR VALVES

KIENE VALVES are designed to give good service under most severe conditions, WILL NOT BLOW OPEN, as valve opens against pressure. The KIENE VALVE HAS EFFECTIVE GAS SEAL when opened or closed, without use of packing or glands.

The KIENE VALVE is SMALL AND RUGGED, 4¼" in length and requiring only 3¼" circle of space for attachment. Has been operated at pressures up to 10,000 psi. ALL KIENE VALVES have standard indicator plug and wing nut connection. Regularly furnished with male ½" NPT engine connection. Other threads furnished on order. Special adaptions for most Diesel locomotive engines.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

organizational news

De Laval Advertising Manager

The De Laval Separator Co. announces that it has appointed John H. Bronson as acting advertising manager to replace Earl C. Edgar who has resigned.

Mr. Bronson joined the company three years ago. In the course of his advertising career he has been with Westinghouse Electric International Co. and the Hartford Electric Light Co.

Purolator Promotes Two

Purolator Products, Inc. announces the appointment of Joseph G. Van Nest as vice president in charge of purchasing and Herbert W. Thogode as a director and secretary-treasurer of the company.

Mr. Van Nest was formerly director of purchases. Prior to his association with Purolator, he was general purchasing agent for Mack Mfg. Corp.

Mr. Thogode has a service record of 30 years with the company, originally joining it as an accountant. He was elected a director to fill a vacancy caused by the death of Carl M. Owen.

H. W. Thogode

J. G. Van Nest

Field Manager AAF Sales

American Air Filter Co., Inc. announces the appointment of John W. Frazier to the position of field manager of air filter sales.

Mr. Frazier has been with Trion, Inc. for the past seven years as general sales manager and was formerly supervisor of dealer relations with Equitable Gas Co. The assignment he assumes is a new position for the company and is a move to coordinate the work of the various district sales offices over the nation.

American Bosch Appointments

Donald P. Hess, president of American Bosch Corp. since 1936, has been elevated to the post of chairman of the board. He succeeds Joseph E. Ridder who retired from that post but who remains a director. Charles W. Perelle, who has been president and general manager of ACF-Brill Motors Co., has been elected president and a director of Bosch and its subsidiary, Arma Corp.

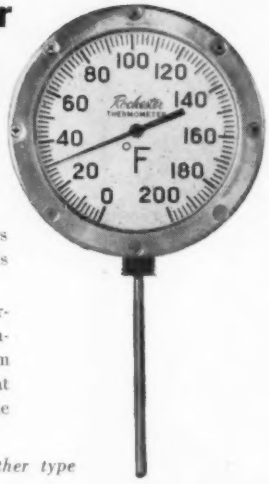
Mr. Hess came to the company in 1938 from Ebco Mfg. Co., having previously been with Timken Roller Bearing Co. Besides his connection with ACF-Brill, Mr. Perelle has been with Hughes Tool Co., Hughes Aircraft Co., Trans-World Airlines, and Consolidated Vultee Aircraft Corp.

C. W. Perelle

D. P. Hess

• Readily Visible
• Adjustable Dial Position
• Submersible

the RIGHT thermometer for your requirements



Shockproof accuracy—easily maintained with a simple external screw adjustment — another Rochester first.

All stainless steel construction including the weld, offers more corrosion resistance. Hermetic sealing protects dials from fogging.

Rochester Model #1850 is recommended for use wherever a straight form thermometer can be used to advantage. Model 1850 in the standard form has the stem located at the bottom. The stem can also be located at any other position around the entire periphery of the hoad. Available in stem lengths from 2½" to 48".

For further information on this straight form or other type thermometers—write

Rochester Manufacturing Company, Inc.
34 Rockwood St., Rochester 10, N. Y.

DIAL THERMOMETERS · GAUGES · AMMETERS

Consult ELLWOOD on all Your Forging Requirements

Quality Precision Crankshafts For Diesels — Since 1910 . . .

ELLWOOD CITY FORGE COMPANY
CRANKSHAFTS · CONNECTING RODS
MACHINE FORGINGS
ELLWOOD CITY, PENNA.

new products

Solenoid Valves

A complete line of "DO" (diaphragm-operated) solenoid valves for stand-by control of fluid flow and for automatic cycling operation is being produced by Eclipse Fuel Engineering Co., 1011 Buchanan St., Rockford, Ill. They are said to operate on line pressures as high as 150 psi and as low as ½ in of water. Ideal cycling range is from 40 to 60 cycles per min.

The valves are supplied with aluminum bodies for gas and air service, and brass bodies for oil and water service. Valve seats and armature

pilot plungers are stainless steel. Such conventional parts as valve guides, seat ring gaskets, pilot valve cages, and coil retaining screws, washers and springs have been eliminated. The valve has only two moving parts: the solenoid plunger and the diaphragm. Rim of the diaphragm serves as a gasket. The valve may be operated by automatic control devices or by manual switches and may be serviced without removal from line.

Flexible Drill

Ritmar Corp., 183 New York Ave., Huntington, N. Y., announces the "Flex-Drill", a new tool designed for drilling in hard-to-get-at places. It consists of three parts: flexible coupling, extension rod, and handle.

The coupling is a 3-in length of ¼-in diam cable which will bend almost 90 deg. Chuck end has a 5/16-in, 24 female thread to accommodate a drill chuck, while the other end is threaded to fit extension rod. Handle serves as a bushing for the fitting at the chuck end and also acts as the guide. Quickly assembled with accessories, the unit is said to be capable of almost any job that the standard drill cannot reach.

IF YOU'RE A DIESEL EXECUTIVE

IN THE RAILROAD, UTILITIES, CONSTRUCTION, TRUCKING, BUS, SERVICE, OR ALLIED FIELDS

then you'll be interested in the special offer DIESEL POWER is making that will help your personnel to operate at peak efficiency.

Other top diesel men have already found that DIESEL POWER . . .

. . . spells out basic diesel facts to their employees—is especially helpful in training men new to the ways of diesels.

. . . supplies practical tips that help slash their maintenance and operating costs.

. . . brings their top personnel the latest news on new engines, parts, and services.

They've entered scores of group subscriptions for their employees because they've found it's "good business" to have this channel of diesel information at the fingertips of their key men.

You can give your employees that same aid to more efficient performance—and for as little as 50% of our regular subscription price.

Our standard one year subscription price is $3.00. However, if you enter 5 through 9 subscriptions, your rate will be but $2.00. Moreover, on 10 or more subscriptions, you need pay only "half-price"—$1.50—per subscription.

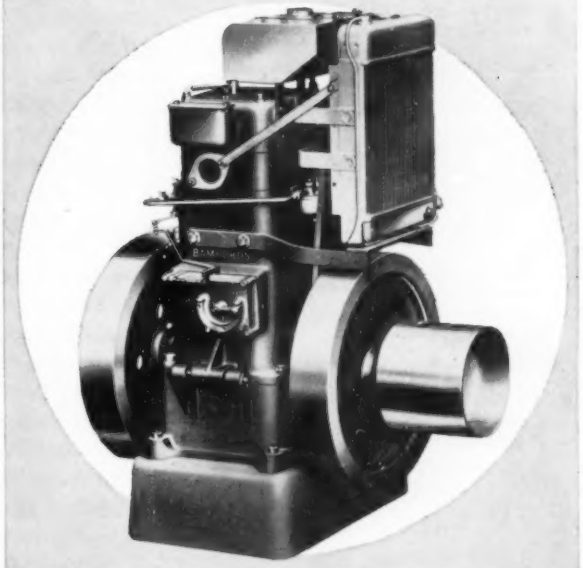
Merely send us the list of names for whom you wish subscriptions entered, together with the necessary remittance to cover those subscriptions. We'll then start the issues rolling.

NOTE: On subscription orders outside the U. S., please check with us on price before entering subscriptions.

DIESEL POWER
192 Lexington Avenue
New York 16, N. Y.

Bamfords
FUEL-SAVING Slow-Speed Diesels

QUANTITIES NOW AVAILABLE
to meet Full Demand in U. S. A., Canada, Mexico



Now—for the first time—the supply of Bamfords slow-speed diesels allocated to North America is large enough to meet the demand. This famous English make offers simplified design, easy maintenance and low fuel cost.

Seven models, ranging from 3½ to 16 bhp at 600 to 700 rpm. They are easily coupled and require no speed reduction unit for most driven equipment. All are of the direct injection type for efficient combustion at all loads.

Patented hinged crankcase permits easy access to working parts for inspection and maintenance—no need to disengage injection lines or other vital connections.

Detachable governor, an enclosed and self-contained block unit, can be removed for adjustment without disturbing other parts.

Less wear on parts. The overhead exhaust and screened inlet valves are operated by a single cam and function with a minimum of working parts. Each cylinder has a renewable liner, so replacement of the cylinder unit is never required. Bamfords Diesels are backed by expert installation and repair service, and ample parts stocks. For further information, ask your nearest diesel sales and service agency or write:

INTERNATIONAL SELLING CORP.
Diesel Division
122 East 42nd Street, New York 17, N. Y.

On Display at ASME Oil and Gas Power Conference Kansas City, June 14-17

IB 101

HILCO

LUBE and FUEL OIL PURIFICATION . . .

GET RID OF DIRTY OIL . . .
GET LOWER OPERATING COSTS
LONGER EQUIPMENT LIFE

HILCO oil purification means complete oil purification! With a HILCO you get removal of sludge, acids, carbon, water and fuel dilution economically and efficiently. HILCO operation is continuous, all-electric and automatic.

Clean oil at all times reduces down time, increases production and HILCO units pay for themselves in savings.

HILCO offers a wide range of oil purification units . . . one to meet your needs. Write us about your equipment . . . and get recommendations at no obligation.

THERE'S A **HILCO** *FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM*

Oil Reclaimer

HILCO has 25 years experience in oil purification. Let this experience work for you.

Filter

PURIFIERS
FILTERS
RECLAIMERS
CONDITIONERS

A complete range of sizes and systems for oil purification.

WRITE FOR **FREE** *LITERATURE NO OBLIGATION ON YOUR PART*

THE HILLIARD CORPORATION
120 W. FOURTH ST.
ELMIRA, N. Y.

IN CANADA — UPTON-BRADEEN-JAMES, Ltd.
890 Yonge St., Toronto 3464 Park Ave., Montreal

news of our industry

Standby Diesels at Grumman

The mammoth Peconic River plant near Calverton, N. Y., which the Navy has completed for Grumman Aircraft Engineering Corp., has an electrical system adequate for a small city. Broadway Maintenance Corp., in cooperation with Charles A. Mulligan, Inc., handled the complete electrical installation which involves three miles of 66,000-v transmission line, an outdoor 66,000-v to 13,000-v stepdown substation, 13,000-v switchgear and underground cables, 12 indoor distribution substations of 13,000 v each, and all interior wiring for light and power.

Located about 75 miles from New York City on a 4500-acre tract, the new Grumman layout includes an assembly-administration building, a steam heating plant, a paint shop, a flight operations building, hangars and warehouses, and is the first aircraft plant to be built solely for jet assembly and flight operation.

To guard against sudden emergencies, one room in the assembly building houses diesel-generator emergency lighting and power equipment. Similar diesel-generator installations are located in the steam plant. Total cost of the new plant is $20 million, with the electrical system established as $2 million.

Brazil's Fleet to Use Bunker C

The government of Brazil has contracted with Diesel Economy Devices, Inc. for conversion of its tanker fleet of 12 diesel-powered vessels to burn Bunker C-type boiler fuel oils. Orders have been placed for necessary machinery and equipment for the conversion. Special engineering and fabrication of the complete fuel conversion units and controls is expected to be ready shortly.

Actual installation aboard each vessel will be made at a port of call of each ship and will be finished, tested, and the ship ready to get under way again in four or five days, it is stated.

Upon completion of the contract, the company expects to begin work on a similar contract in South America involving conversion of stationary public power plants at an expenditure of approximately $6 million. The company also plans future attention to the domestic market where, according to the company, most of over 2000 stationary diesel-powered power plants are capable of being converted to cheap fuel oil.

Nodular Iron for Crankshafts

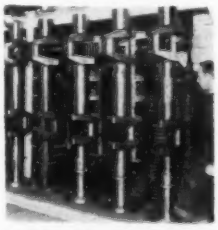
Concluding four years of research with nodular iron, Cooper-Bessemer Corp. has now applied the comparatively new ductile material to production of crankshafts for gas engine-driven compressors.

Ductile iron provides an unusual combination of high strength, high wearing qualities, and good machineability, particularly ideal for engine crankshafts. A high "notched endurance limit" characteristic makes the metal especially suitable for heavy-duty crankshaft service.

Physical properties of nodular iron are compared below with those traditionally used.

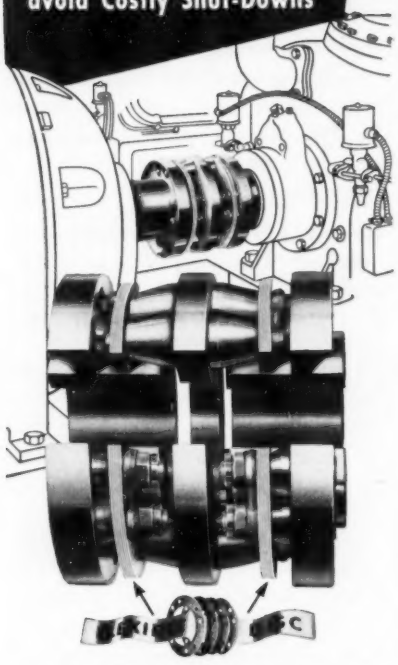
	Ductile Iron	Forged Steel
Tensile Strength	79,200 psi	80,100 psi
Endurance Limit, smooth	31,500 psi	35,000 psi
Endurance Limit, notched	20,750 psi	17,800 psi
Modulus of Elasticity	22,600,000	29,000,000
Brinell Hardness	220	170

Cooper-Bessemer is one of the first companies to initiate development work on high-strength irons. Research started in 1935. Since then, many thousands of cast crankshafts have been produced at its foundries in Mt. Vernon, Ohio and Grove City, Pa., and are operating successfully, driving pumps and compressors in many diversified industries.



Actual development work began in 1949. The first ductile iron crankshaft was shipped in June of 1953 on a Cooper-Bessemer GMX-4 gas engine-driven compressor.

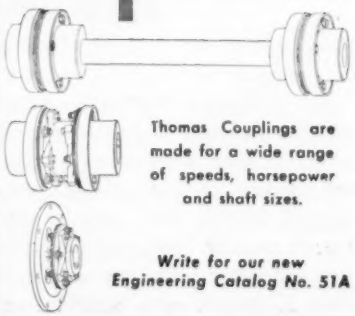
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

Write for our new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

new literature

Spray Gun Motion Study

High quality finishes at a minimum cost and with less fatigue is the theme of a booklet, "Spray Gun Motion Study," published by the DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio.

The booklet contains description of procedures in spraying various surfaces. To obtain maximum efficiency, the publishers recommend study of the particular object to be sprayed for determination of most effective gun movements. A continuity of motion is important to increase efficiency of the operation, it is pointed out. Correct triggering not only saves material, but also reduces excessive overspray which can ruin a finish.

Hardfacing Alloys

The American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14 St., Chicago Heights, Ill., has issued a 48-page catalog describing its complete line of hardfacing and buildup rods and electrodes. Over 70 photographs show typical applications. Full metallurgical and physical properties are included. A special technical section is contained for help in solving unusual wear problems.

The Case for Re-Refined Oil

The Assn. of Petroleum Re-Refiners, 1917 Eye St., N. W., Washington 6, D. C., has published a completely revised and enlarged edition of "The Case for Re-Refined Oil," presenting both technological and economic aspects of petroleum refining as they relate to use by large industries, transportation companies, and the like.

A section of the publication is devoted to the increased need for conservation of petroleum, giving figures showing oil wastage. Another chapter, of interest to those who want to enter the business, gives cost breakdowns on establishment of an efficient operation as well as histories of past successes and failures. The publication is documented with maps, charts, and technical papers.

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★ FLEXIBLE HOSE ASSEMBLIES

STRATOFLEX Hose Fittings and Hose Assemblies are designed to give dependable service and maximum performance. Cost-minded operators in the industry recommend STRATOFLEX! Whatever your requirements in flexible hose assemblies and detachable reusable hose fittings or elbow hose fittings — specify STRATOFLEX!

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organizational news

Pesco Products President

Robert G. Allen has become the new president and general manager of the Pesco Products Div. of Borg-Warner Corp. to succeed Robert J. Minshall who has been named chairman of the supervisory board and director of research and development for the division.

Mr. Allen, a former Congressman from Pennsylvania, was president of the Duff Norton Mfg. Co. before the war. He joined the Baldwin Locomotive Corp. in 1945 and was made general sales manager in 1946. He went to Great Lakes Carbon Corp. in 1947 as general manager of its electrode division and in six years rose to the vice presidency of the corporation, from which post he comes to Pesco.

Cat Promotes Engineering Head

G. E. Burks, former director of engineering, has been appointed director of engineering and research of Caterpillar Tractor Co. In his new position, he will administer and coordinate all engineering and research activities of the company, a function previously performed by the president.

Mr. Burks joined the engineering staff of the company in 1937, and became assistant chief engineer in charge of engine design a year later. In 1942, he was named chief engineer and was appointed director of engineering in 1953.

Detroit Aluminum Elevation

Detroit Aluminum & Brass Corp. announces the promotion of William E. O'Reilly to vice president. Mr.

William E. O'Reilly

O'Reilly was formerly sales manager for the equipment division and has been with the company 10 years. He served on the War Production Board and prior to that was with White Motor Co.

New National Supply President

Arthur W. McKinney has been elected president of The National Supply Co. to succeed Alexander E. Walker who remains chairman of the board and chief executive officer of the company.

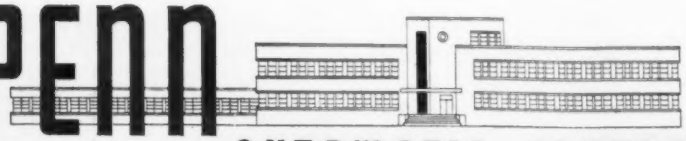
Arthur W. McKinney

Mr. McKinney started his career with the company in 1920 as a salesman. He won promotion to assistant manager of sales in 1929, manager of sales in 1934, general manager of sales in 1938, and vice president and general manager of sales in 1940. He has served as executive vice president since 1948. Mr. McKinney is also serving his second term as president of the Diesel Engine Manufacturers Assn.

here's why your engine needs this PENN SAFETY CONTROL

Overheated cooling water or lube oil pressure failure can develop anytime in any engine. When it does... the Penn Safety Control goes into action. Automatically it sounds an alarm, flashes a warning light or stops engine operation... whichever you prefer. Then, the fault can be investigated and corrected *before serious damage* occurs! Learn more about this low-cost protection. Write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ont.

PENN



AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

news of our industry

Strain Gauge Techniques

Elementary information on the use and application of electric (wire-resistance type) strain gauges will be the subject of two, 1-week special programs as part of the 1954 summer session at the Massachusetts Institute of Technology. The two programs, "Fundamentals of Strain Gauge Techniques" to be given Aug. 9-13, and "Applications of Strain Gauge Techniques" set for Aug. 16-20, will be under the direction of Dr. William M. Murray, associate professor of mechanical engineering.

The first program will include lectures and demonstrations on basic theory, interpretation of observations, calculation of stresses from measured strains, considerations of electrical circuits, and techniques of use both in laboratory and field.

The second program supplements the first by giving practical personal experience in the actual use of the gauges and associated equipment. Laboratory exercises are scheduled to provide practice in typical problems encountered in industry.

New Industrial Show Planned

Another giant industrial show, the Material Handlings Exposition, is scheduled to be held again in Chicago during the week of May 16, 1955, it has been announced by Clapp & Poliak, Inc., producers of the event. Theme of the new show will be "The Concept of Obsolescence".

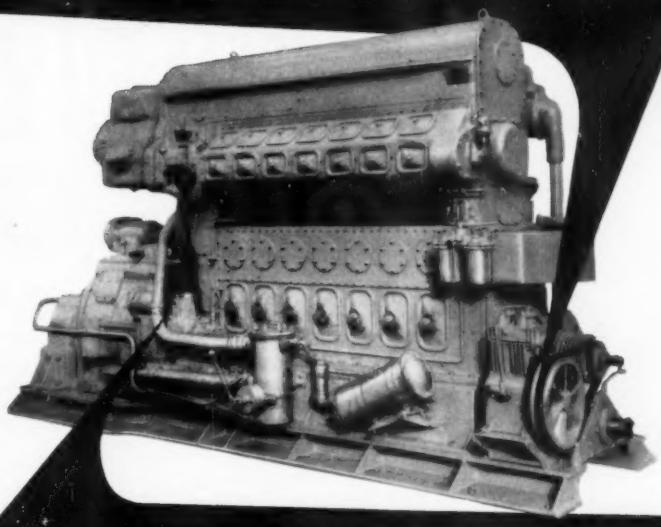
The new theme was adopted to emphasize that most handling equipment put into use in recent years is being outmoded by technological advances. The show, first begun in 1947, was last conducted in Philadelphia in 1953. At the 1955 exposition, more than 115 types of equipment will be on display, each type represented by dozens of different models and designs. Displays will occupy the largest indoor exhibit space available in the nation.

Canada Plans Power Extension

Plans for increasing the capacity of seven of its 19 diesel-electric generating stations have been announced by the British Columbia Power Commission to meet growing power load. In addition, a new diesel plant will be constructed at McBride, east of Prince George, to feed a new distribution system, which when energized later this year will be the 28th power district operated by the Commission in the province.

The diesel expansion work is to be as follows: Quesnel will have a 1000-kw unit added to bring capacity to 4200 kw. Williams Lake will add a 1000-kw unit and remove a 200-kw unit for a 2300-kw total capacity. Terrace will have its powerhouse expanded by a 1000-kw unit to bring capacity to 2200 kw. Burns Lake will add a 1136-kw Fairbanks-Morse OP unit and have its powerhouse altered to accommodate the unit, for a net capacity to 2136 kw. Hazelton will have its powerhouse altered and a 150-kw unit added for 450-kw capacity. Houston will have a 100-kw Buda unit transferred to it to up capacity to 260 kw. Queen Charlotte City will take on a 100-kw unit, which addition will bring capacity to 312½ kw.

Quincy FOR DEPENDABLE STARTING



on this FAIRBANKS MORSE DIESEL

Fairbanks Morse & Co. selected a Quincy Compressor to supply compressed air for starting this new apposed piston diesel. Like other leading diesel engine manufacturers, Fairbanks Morse used a Quincy because it gives long life and trouble-free service.

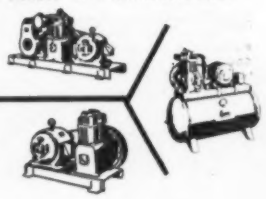
Specify a Quincy Compressor for your next diesel starting job. Compact, rugged Quincy Compressors will give you a dependable air supply.

There's a Quincy Compressor for every job. Let us help you select the right model from a variety of mountings and sizes from 1 to 90 C.F.M.

Write Dept. J-37, Quincy Compressor Co., Quincy, Illinois, for catalog on Quincy Compressors for diesel starting.

MAKERS OF THE WORLD'S FINEST AIR COMPRESSORS

QUINCY COMPRESSOR CO.
QUINCY, ILLINOIS



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new products

4-In-1 Crawler Attachment

As an aid to small contractors who are seeking one piece of machinery capable of handling multiple earth-moving jobs, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., is making available its "Four-In-One" hydraulic-controlled attachment for TD-6 crawler tractors. With the new control, the attachment can be immediately converted into a bullclam shovel, a bulldozer, a front-end loader, or a clamshell by placing the "shovel-selector" lever in the desired position. Lever is in easy reach of operator and selection can be made whether tractor is in motion or standing still.

In addition to the four shovel features, the unit may also be used as a backhoe. Overall width is 68 in; height is 40 in. Capacity of shovel is $\frac{7}{8}$ yd with 3000-lb lifting capacity. Break-out force is in excess of 8500 lb.

inside tip.. only ....HONAN-CRANE DIESEL OIL PURIFIERS give you so many vital engineering features

The Honan-Crane "Multi-Cartridge" Purifier is engineered, inside and out, to provide the high-flow, *thorough* oil purification essential for diesels. Removes *all types* of harmful contamination . . . substantially reduces engine wear and maintenance costs . . . quickly pays for itself in oil savings alone!

Here are a few time-tested Honan-Crane features:

1. Four types of interchangeable cartridges.
2. Clean oil is drawn from top of purifier for maximum cartridge efficiency.
3. Cartridge construction prevents channeling.
4. Electric heater bands maintain correct oil temperature for purification.
5. Oil-and-gas-tight seals and gaskets prevent contamination of clean oil passages.
6. Double-decked cartridges save floor space, permit greater operating efficiency.
7. Positive locks and pressure springs keep cartridges securely in place, prevent by-passing.
8. Purifier is fully equipped with automatic controls and safety features.

INTERCHANGEABLE CARTRIDGES FOR HONAN-CRANE PURIFIER

TYPE "MC"—Cotton bag packed with Cranite (fuller's earth). Removes products of oxidation . . . acids, gums, etc. Provides refinery-type purification.

TYPE "MF"—Perforated metal basket packed with Palconia (cellulose fiber). Recommended for additive oils for complete removal of dirt, scale and other solids.

TYPE "S"—Contains Palconia (cellulose fiber). Performs same as Type "MF." Fiber center-tube simplifies disposal of spent cartridge by burning.

TYPE "E"—Similar to Type "S" except that filtering material is cotton waste and excelsior. Type "E" is recommended when water is encountered in the oil.

Honan-Crane Fuel and Lube Oil Purifiers are available for any size or make of Diesel Engine. For detailed information, write Honan-Crane giving make, model and H.P. of your diesel. Describe any unusual aspects of your particular oil purification problem.

HONAN-CRANE CORP.
305 Wabash Ave., Lebanon, Indiana
A Subsidiary of
HOUDAILLE-HERSHEY CORPORATION

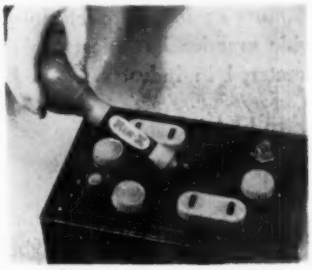
High-Pressure Grease Gun

E. D. Allmendinger, Inc., 7-11 Water St., New York 4, N. Y., is marketing a high-pressure grease gun, the Gre-Zer-Ator, equipped with a reversabout booster. The unit will develop up to 7000-lb pressure and with the booster, can be operated by either pushing or pulling the handle, depending upon available space.

Designed to be used on the original grease container, the product will fit any standard 25- to 50-lb drum ranging in diameter from $9\frac{5}{8}$ in to $12\frac{1}{8}$ in. It comes equipped with 10 ft of grease hose. One man, using one hand, is capable of doing the grease job.

Water Demineralizer Device

LaMotte Chemical Products Co., Towson 4, Baltimore, Md., is marketing Min-X, a double-acting device for producing chemically pure water, claimed to be equivalent to triple distilled water. Principal uses are for storage batteries and steam irons where water impurities may impair operation.



The product consists of a tube, fitted with a replaceable resin filter, a rubber bulb attached to top of tube, and a rubber tip to bottom of tube. Tap water is taken into the bulb, which when squeezed, dispenses mineral-free water. When contents of original tube turn brown, a refill is necessary.

Heavy-Duty Pipe Cutter

Toledo Pipe Threading Machine Co., 1431 Summit St., Toledo 4, Ohio, announces a new heavy-duty pipe cutter of the wheel and roller type. Capacity is 1/8-in to 2-in pipe.

The high alloy steel cutter wheels are said to leave practically no burr. Rollers in the hook provide a square base when starting tool in pipe. The frame is formed to fit the hand and is guaranteed warp-proof.

new literature

Woodworking Safety

The National Safety Council, 425 No. Michigan Ave., Chicago 11, Ill., has issued "Jig and Fixture Design for Woodworking Safety", a 100-page volume describing the many devices that can be used to keep woodworking machine users from being injured by power tools.

The book contains 61 illustrations showing in detail stock supports for more efficient operation with greater safety. Beginning with the simple push stick for feeding stock into a circular saw, the book progresses to more intricate devices designed for use on saws, jointers, shapers, routers, and belt sanders.

Diesel-Powered Locomotives

Henschel & Sohn, Kassel, Germany, has issued literature concerning its diesel-hydraulic and diesel-electric locomotives for line and shunting service and for open cast mining. Principal dimensions, construction details, and standard and special equipment for each type are included.

Gauges and Valves

A 4-page data bulletin, No. 237, has been issued by Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass., covering its special purpose heated and cooled gauges and valves for obtaining level readings of liquids that boil or surge and those that are heavy and don't flow at normal temperature. Special design and construction features are described and illustrated.

Instruments and Accessories

Burlington Instrument Co., 153 No. 3rd St., Burlington, Iowa, has issued an instrument and accessories catalog assembled so that outstanding characteristics of their design in respect to size, type of material used, and style of mounting are the subject of a consistent series of column headings. This is intended to help the user visualize the best combination of factors related to design and price.

Motor Scrapers and Wagons

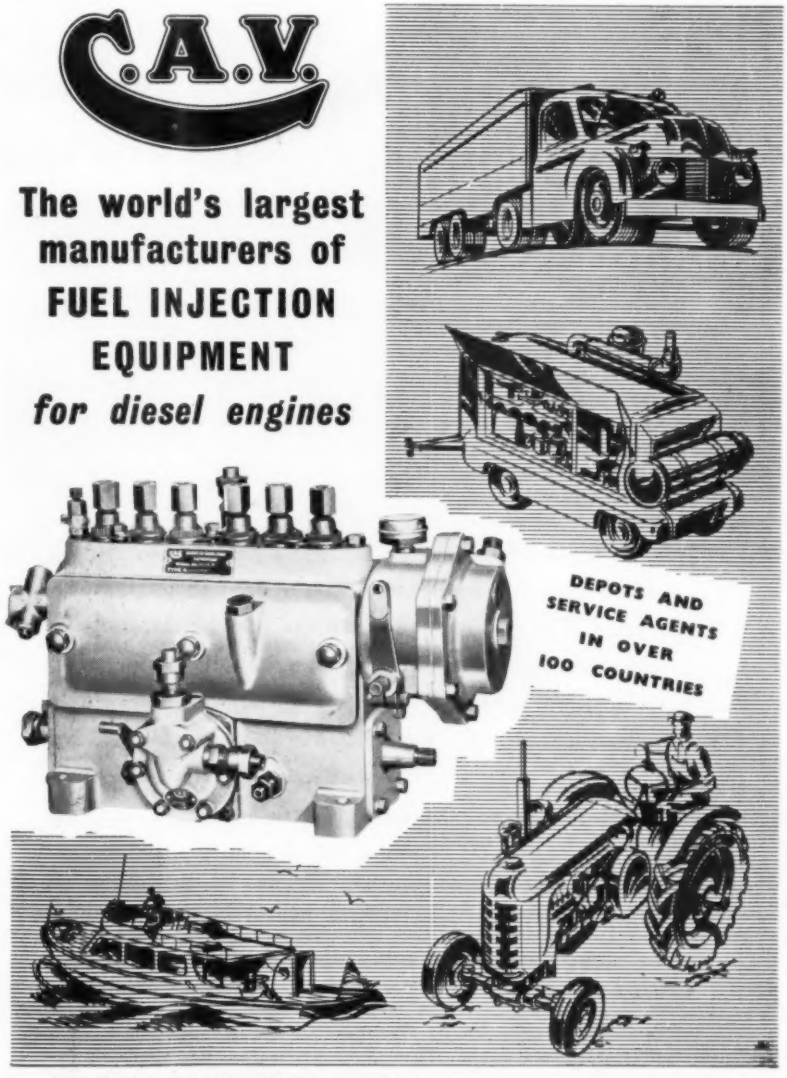
Mechanical and performance features of its Models TS-200 and TS-300 motor scrapers, and of motor wagons TR-200 and TW-300, are described in detail in two catalogs released by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Views of the equipment are included, along with photos showing features, in addition to specifications and other data. In-the-field shots show performance ability, versatility, and efficiency.

Temperature Transmitter

Catalog 1022, newly released by Penn Industrial Instrument Corp., 4110 Haverford Ave., Philadelphia 4, Pa., describes an indicating temperature transmitter which features dial-type thermometer and pneumatic transmitter in a combined unit.

Close-up photo illustrations show back and front views. Line illustrations of bulb and socket variations are also included. Descriptions give specifications, uses, and materials of construction.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The world's largest manufacturers of FUEL INJECTION EQUIPMENT for diesel engines
DEPOTS AND SERVICE AGENTS IN OVER 100 COUNTRIES

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., 653, TENTH AVENUE, NEW YORK, 19, N.Y.
Sales Office: 14820 DETROIT AVENUE, CLEVELAND, 7, OHIO.

C.A.V. Fuel Injection and Electrical Equipment

174-607

organizational news

GE Manufacturing Manager

R. A. Miller has been named manager of manufacturing of General Electric Co.'s locomotive and car equipment department at Erie, Pa. He will be responsible for all activity relating to physical construction of the department's products.

Mr. Miller joined the company in 1923 as an apprentice at the Erie Works. In the following 11 years, he worked in the tool department, progressing to assistant foreman, head of department apprentices, estimator, and finally assistant supervisor. In 1939, he became superintendent of locomotive manufacture and in 1948, superintendent to motor manufacturing. In 1951, he was assigned to study locomotive manufacturing facilities in Australia, returning in 1952 to be appointed superintendent of control manufacturing. Prior to his present appointment, he was manager of employee relations.

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NEW YORK, N.Y.
SINCE 1845
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headquarters for
CORROSION CONTROL
with CHROMATES

Mutual's Chromates are widely used throughout industry to inhibit corrosion. In the diesel field, they are used advantageously in the water cooling systems of locomotive, marine and stationary diesels — in closed engine jackets, open towers and evaporative condensers. Chromates are particularly effective in combatting corrosion of engine cylinder liners.

Mutual is the oldest and largest manufacturer of Chromium Chemicals. Our technical staff will be glad to advise you on the application of Chromates in your corrosion problems.

SODIUM CHROMATE — SODIUM BICHROMATE
POTASSIUM CHROMATE — POTASSIUM BICHROMATE

MUTUAL CHEMICAL COMPANY OF AMERICA
99 Park Avenue New York 16, N. Y.
Plants at Baltimore and Jersey City

Joins Cummins Service

J. L. Oneal, formerly regional service manager for the Cummins Engine Co., has joined the sales staff of Cummins Service and Sales, Los Angeles.

Mr. Oneal was in the South Pacific with the Navy during the last war, as a diesel specialist. He was field service representative for the Cummins factory for nine years and regional service manager for the Rocky Mt. Div. for three years.

Sealed Power Elections

Two new officers and one new director were elected at the annual meeting of the Sealed Power Corp.

Gordon E. Reynolds

Rick E. Murbarger

Donald M. Hesling

Gordon E. Reynolds was elected secretary-treasurer and a member of the board. Rick E. Murbarger was elected vice president in charge of sales. Donald M. Hesling was elected vice president in charge of engineering and manufacturing.

Mr. Reynolds started with the company in 1935 and was plant manager before his election as secretary in 1950 and assistant treasurer in 1952. Mr. Murbarger joined the corporation in 1937 and became general sales manager in 1951. Mr. Hesling entered Sealed Power in 1937 and became director of engineering and manufacturing in 1952.

new products

Electronic Wheel Balancer

To eliminate unbalance of vehicle wheels (including duals), an electronic wheel balancer has been announced by Alemite, a division of Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill. The new balancer precisions up and down and side to side motion under all conditions of tire distortion caused by centrifugal force. Both front and rear wheel assemblies are said to be balanced in true operating position and at all driving speeds.

The basic balancer unit includes chassis, electronic dual-range meter, and strobe light, all mounted in a portable cabinet, plus a vibration pickup unit with cord. In use, the vibration pickup is placed under the jacked-up vehicle with the magnet touching the axle. A reference marker, chalk, or masking tape can be pinpointed on the spinning wheel by the flashing strobe light, indicating the positioning of the wheel for the application of the necessary corrective weights. Amount of unbalance is relayed by the pickup through the amplifier and is recorded on the meter, indicating the amount of weight to be applied.

High-Duty Tube Fittings

A new line of leakproof tube fittings, designed to withstand severe vibration and major tube movement, is being manufactured by the Dekoron Products Div., Samuel Moore & Co., Mantua, Ohio.

The fittings are said to effect substantial savings in installation time because of their 2-piece construction. They are delivered assembled with nut in body, requiring only that the tube be inserted into fitting body and the nut tightened. This shears the sleeve from the end of the nut and the sleeve then attaches itself to the tube.

Loose sleeve, flaring, or special preparation are said to be eliminated. Five times as much vibration as compression or flared tube fittings are claimed to be withstood. The fittings may also be disconnected and reconnected many times without leakage. Most sizes are furnished in brass, aluminum, steel, and 316 stainless.

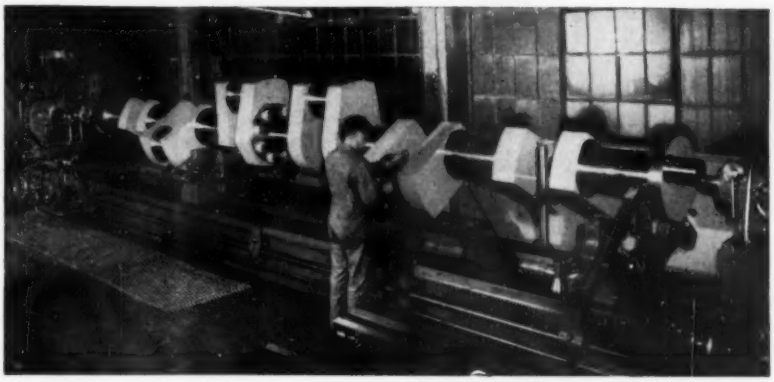
New Cat Tractor

In conjunction with the 50th anniversary of the crawler tractor, Caterpillar Tractor Co., Peoria 8, Ill., announces a new 150-hp 4-wheeler. The new tractor, designated DW15, is powered by a 6-cyl D326 diesel, of 5⅛-in bore by 6-in stroke, and producing the 150-hp at 1800 rpm. Engine features include aluminum alloy pistons with cast in iron band backing for the top compression ring, and with chrome-nickel steel heat plugs incorporated into the pistons.

The tractor, designed for principal use with the No. 15 or No. 10 scraper

and W10 wagon, includes wagon controls and windrow breaker. It has a gasoline starting engine with a 6-v electric starter. Standard transmission gives double speed ranges, 10 forward up to 24 mph and two reverse up to 3.3 mph. A 75-gal fuel tank contains enough fuel for a full day of operation. Overall length of the tractor is 16 ft, 8 in.

DIESEL CRANKSHAFT REPAIRING AND REFINISHING



The above shaft had one damaged crank throw and center coupling section replaced, also completely refinished all over. We repair and refinish shafts of all sizes and types. Some damaged shafts straightened and the crankpins refinished in place. All types of heavy power plant and marine equipment serviced and repaired.

We give special attention to emergency work. Our services include experienced personnel available for on location inspection and work, or to recommend action. Our facilities include portable equipment and the ability to handle many types of cost saving field repairs.

We now manufacture a portable precision type crankpin refinishing machine for sale and invite your inquiries.

WASHINGTON IRON WORKS, INC.

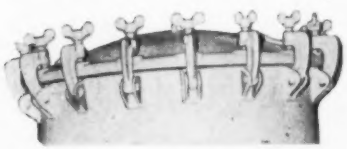
Established 1876

SHERMAN, TEXAS

IF YOU ARE BUYING
FULL-FLOW
OIL FILTRATION

WHY not get the filter and cartridge combination that gives you ALL of the features you want?

LOOK AT THIS!



Briggs PIONEERS IN MODERN OIL FILTRATION "EASI-LIFT C CLAMP COVER" . . .

no lost motion, no fooling around with nuts and bolts . . . *no tools needed.*

GET A FILTER TANK TAILORED TO YOUR NEEDS

. . . Briggs tanks are highly flexible, no long waiting period for delivery, INLET AND OUTLET size and connections where YOU want them.

WORKING PRESSURES UP TO 125 P.S.I.

ALL STEEL, SEAMLESS, DEEP DRAWN TANKS

FULL-FLOW FROM 25 TO 400 GPM WITH Briggs PIONEERS IN MODERN OIL FILTRATION PATENTED ALL CELLULOSE DISC-PAC CARTRIDGE

- HIGH FLOW RATE
- HIGH DIRT PICK UP
- HIGH DIRT RETENTION

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news of our industry

Irish Rail Scraps Steamers

The Irish Railroad has recently signed a $135 million contract for 94 diesel-electric locomotives and announced that all its steam locomotives will be discarded. The company, Coras Iompair Eireann, will build 19 diesel shunting locomotives, 340 new cars, and 3500 boxcars at its own plant.

The contract for the 94 locomotives went to British firms in the face of 31 bids from many parts of the world including the United States, Canada, West Germany, Sweden, France, Belgium, and Holland. The contract is shared between Metropolitan-Vickers, Crosley Brothers, Metropolitan-Cammel Carriage Wagon Co., and the English Steel Corp.

See Truck Noise Reduction

Suppression of unusual truck noises is in sight, according to Lewis C. Kibbee, chief of the equipment and operations section of the American Trucking Assns., Inc. In a speech before the Akron Kiwanis Club, Mr. Kibbee said that "roughly we have taken the noise spread and cut it in half" in setting standards for new trucks being manufactured. "As time goes on, the standard will be tightened up and commercial vehicles will get quieter and quieter."

Equipment for measuring truck noises has been developed by the Armour Research Foundation under the sponsorship of the ATA and has been accepted by truck manufacturers. The ATA official praised efforts of manufacturers and the public and noted that "we have come a long way since 1948 and 1949 when we set out to do something about truck noise. . . New trucks will certainly be a lot better than in years past, and those built in subsequent years will be even better than those built in 1954. This infusion of new vehicles into the fleet will gradually replace older vehicles now on the road, and these new vehicles will be quiet."

The spokesman added that vehicles now on the road are not being ignored. He said that replacement muffler manufacturers are working with the trucking industry to produce mufflers to reach the new standards. He also pointed out that improved mufflers would raise the price of the vehicles and that the mufflers would weigh more.

Anti-Smoke Battlers Get Diesel

Purchase of a new diesel engine to operate the Dartmouth-Windsor junction line of the Canadian National Railways was recently announced by railroad officials. It came as a big surprise to residents of the area.

For some time, town organizations, mainly the Chamber of Commerce, have been campaigning against smoke nuisance and damage caused by the use of coal-burning shunters in the local yards. Costing close to a quarter of a million dollars, this diesel is the first purchased for use in the Dartmouth yard. Currently, there are about five steam engines at work in the area.

CNR facilities have been overtaxed in the district. With recent announcement of high expansions in the Imperial Oil plant, the construction of an oil storage plant, and expansion of an aviation plant, plus growth of the airport and expansion of the town in general, a heavy burden has been placed on the line, described at times as being the CNR's best paying based on amount of business and handled and area covered.

Great Northern Dieselizes On

Great Northern Railways announces that a fifth operating division has become completely dieselized. It is the 1422-mi Butte division, headquartering in Great Falls, Mont., whose mileage also extends into western North Dakota.

Diesel-electric locomotives now move all trains and do all switching in the territory between Williston, N.D. and the Pacific Coast, embracing 3770 miles of the 8300-mi system. On the four eastern divisions, steam locomotives are still in use. In this territory, however, diesels handle all passenger trains and most of the freight trains and switching operations.

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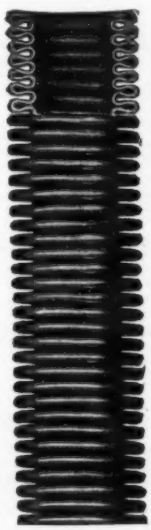

Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalogs in Sweet's Files for Product Designers and Mechanical Industries.

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new literature

Dry Film Lubrication

A new file folder filled with solutions for difficult lubrication problems due to extreme heat, excessive cold, inaccessibility, high speeds, high loads, galling, seizing, and excessive wear, is being offered by Electrofilm, Inc., P. O. Box 106, North Hollywood, Cal.

Electrofilm, a dry film lubricant, is manufactured by the company in various compounds. Case histories of special lubrication problems and how they were solved are offered in the folder. A catalog is also contained, which describes the various compounds and gives applications.

Specialized Industrial Trucks

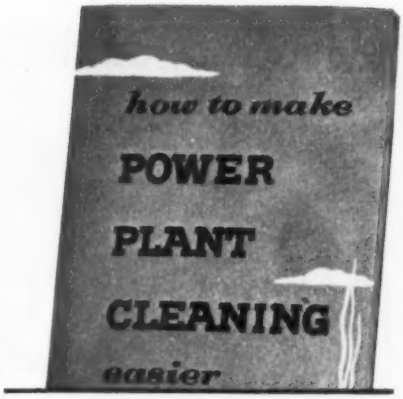
The application of specially-designed industrial trucks where handling jobs cannot be mechanized in any other way, or where basic truck handling economies can be further increased, is the subject of a new brochure issued by Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, Ohio.

Actual case histories are contained, each example illustrated, and with the text presented in a problem and solution form. In addition, one section is given over to drawings and explanatory text covering available attachments for use with fork trucks.

Torque Limiters

Morse Chain Co., 7601 Central Ave., Detroit 10, Mich., has issued an 8-page illustrated catalog (C14-54) describing its torque limiters, compact adjustable slip-clutch devices that provide automatic overload protection for machinery drives.

Complete design and operation information is given, as well as specification tables for a line of 11 standard models having torque capacities ranging from 20 to 620 ft-lb. A spread is devoted to illustration and description of specialized adaptions of the limiters in combination with flexible couplings. Typical applications are listed in a table on the back cover.



Your Guide To Diesel MAINTENANCE CLEANING

Here—in this new Power Plant Cleaning Guide—you will find one money-saving suggestion after another to help speed up your diesel overhauling and reconditioning work. Here, for example, are described the most modern, most effective procedures for:

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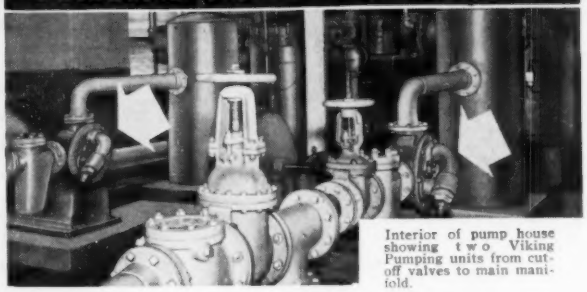

Interior of pump house showing two Viking Pumping units from cut-off valves to main manifold.

Better fueling operations and saving of expense results from the diesel-fueling installation designed by The Central of Georgia Railway at Columbus, Georgia. Pumping, storage and transfer facilities are concentrated at a central location, yet fuel oil is delivered to three widely separated stations by two 300 gpm Viking Pumps, automatically controlled by pressure switches.

If you have a liquid-moving problem, no doubt Viking Pump engineers can help you solve it. To start, write for bulletin 803D.

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news of our industry

Standby Diesel for TV Station

For insurance against sudden losses of power, due to storms which have cut off electricity for as long as four hours, the newly constructed television station, WTVI, at Belleville, Ill. has installed a standby diesel-electric generating unit.

The unit consists of a Caterpillar D326 set equipped with an automatic transfer switch which starts the engine immediately when the regular power supply fails and places the unit into service within eight seconds. The 3-phase, 208-v power source operates a General Electric 12-kw, UHF transmitter.

Studios and transmitters are located in the same building and the standby operates both the synchronous generator and projection camera which are very sensitive to frequency variations. To save on operating costs, the same type of non-premium fuel supplies the station's heating unit as well as the diesel engine.

Screw-Thread Lead Measurement

A technique recently developed by C. E. Haven of the National Bureau of Standards now permits rapid measurement of the pitch, or lead, of internal screw threads without sacrifice of high accuracy required in this work. The method can also be used to determine taper of ring gauges at the same time as lead and is adaptable to measurements in very small ring gauges. Straightness of the bore can be determined simultaneously with lead for straight-thread ring gauges, giving quick assessment of wear at gauge ends.

The more rapid method developed makes use of a taper-testing machine made by Pratt and Whitney Div. of Niles-Bement-Pond Co. The device is mainly an adjustable sine plate on which gauge is mounted, and a carriage which travels on machined ways to move a ball-point probe in and out of the mounted gauge. When the angle between the sine plate and a normal to the plane of the ways is equal to one-half the taper angle of the gauge under test, the pitch line at the bottom of the gauge will be parallel to the ways.

As the carriage moves along the ways, the small ball at probe end contacts the thread flanks in the ring gauge. If taper of the gauge is true, the ball remains at the same elevation as the probe moves from thread to thread. An electrically actuated meter reads errors.

NBS has extended this to permit use of the same settings of the probe to determine lead as well as taper, a method which involves measurement of the carriage movement through use of a glass scale graduated in 0.050-in increments over a 4 in range.

The scale moves with the carriage, and the scale's position is observed with a microscope having four reticle graduations, each equal to 0.01 in on the scale. Special probes are used for very small thread ring gauge measurement. The instrument has also been used to measure lead of thread plug gauges up to 3-in diam.

new products

New Mack Trucks

New tractors of high power-to-weight ratio are announced by Mack Trucks, Inc., 350 Fifth Ave., New York 1, N. Y., to round out its "B" Model line. Two of the tractors, designated Models B-71T and B-71ST are 4- and 6-wheelers, diesel-powered.

The 4-wheel model is rated from 50,000 GCW to 63,000 GCW, depending upon trailer axle combinations. The 6-wheel version carries a 76,800-GCW rating. The series offers a 743-cu in diesel engine delivering 200 hp at 2100 rpm and 537 lb-ft maximum torque at 1200 rpm. A wide range of Mack-built transmission options are offered to fit individual requirements. Included are both 5- and 10-speed, 2-lever duplex types, with additional option of a 3-speed auxiliary available in combination with a 5-speed main box on the 6-wheel tractor only. Featured in the models is the recently developed Vibrasorb clutch to protect parts from destructive vibration.

Spray for Powder-Form Coating

A new metal spray unit for applying hardfacing coatings in powder form is available from Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich. Called Model C Spraywelder, the unit is said to be particularly adapted to application of the company's nickel-base alloys to steel, stainless steel, and some cast iron and copper alloy parts, by the Sprayweld process. In this process, the powdered alloys are first applied by spraying and then fusion-bonded to the part by heating with an oxy-acetylene flame. Metallizing operations using copper, nickel, stainless steel, brass, lead and zinc in powder form can also be handled.

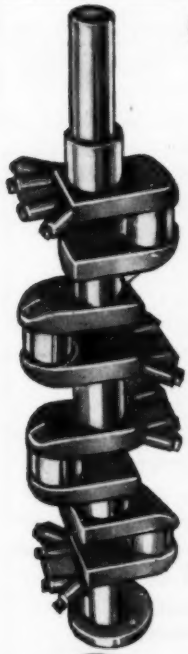
Components of the unit consist of a pistol, hopper, carburetor, air regulator, air filter, and hoses and fittings for oxygen, acetylene and powder. In operation, connections are made to oxygen and acetylene tanks and a factory air supply delivering 10 cfm of dry air at 60 psi minimum. Pistol is either held in hand or mounted on a turning fixture.

Insulated Terminal

For users of heavy-duty wire, a new insulated terminal has been developed by Aircraft-Marine Products, Inc., 2100 Paxton St., Harrisburg, Pa. Known as "Ampli-Bond", it is said to give positive and complete bond of the insulation to terminal sleeve, insure uniform insulation thickness under confined crimping pressures, and to transmit this pressure evenly to center of crimp area.

Insulation is designed to extend minimum distance beyond terminal barrel to provide maximum permanent support and allow use of large-size wire in restricted areas. A separate metallic ring grips wire insulation to prevent exposure of conductor during sharp bends and cable fatigue, and serves as a barrier to foreign objects coming in contact with current bearing members.

The bonded terminals are applied in one operation with manufacturer's pneumatic hydraulic tooling, and are available in a variety of tongue shapes, stud sizes, and in both butt and parallel connectors.



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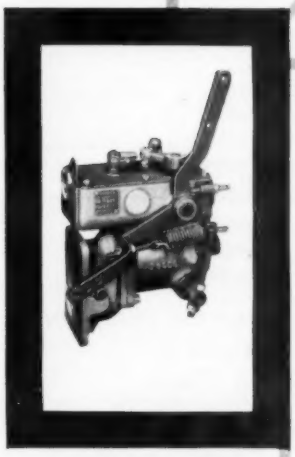

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NORDBERG

new literature

Controls for Liquids and Gases

A revised edition of its general catalog of measuring and control equipment has been prepared by the Simplex Valve & Meter Co., 68th and Upland Sts., Philadelphia 42, Pa. Superseding an earlier volume produced in 1950, and brought up to date, the catalog presents a compilation of 36 pages of value to operating and supervisory plant personnel.

All the company's equipment for the measurement and control of liquids and gases are listed and illustrated by photograph and diagram, along with applicable tabular matter.

Corrosion-Resistant Coatings

To define the serviceability, cost, and life of each material in a line of corrosion-resisting coatings, Carboline Co., 331 Thornton Ave., St. Louis 19, Mo., has published Bulletin 100. The bulletin places corrosive service conditions in broad classifications, defines the company's products in general terms, and estimates the life of the product in each corrosive condition or states flatly, "Not recommended".

Serving as a reference data sheet for the specification or maintenance engineer, the bulletin makes the practical limitation of each material clear by tabulated data. Corrosive conditions are first broken down into groups and products are then classified for use as paints, surfacing materials, or linings. In addition, the bulletin gives complete information on primer requirements for all products on all common surfaces.

Flow Control Pumps

A 16-page bulletin on air-powered controlled volume pumps has been issued by the Milton Roy Co., 1300 E. Mermaid Lane, Philadelphia 18, Pa. The bulletin shows how the pumps are used to solve low-capacity flow control problems and contains graphic presentations of operating principles along with capacity-pressure and air-consumption tables.

General Machine Catalog

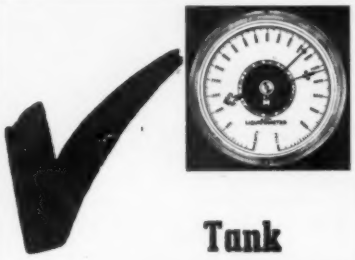
General Catalog 5406, has been released by South Bend Lathe Works, 425 E. Madison St., South Bend 22, Indiana. Subject matter covers the company's complete line of precision tool room lathes and engines lathes, several turret lathe models, drill presses, bench shaper, and the new pedestal tool grinder.

The 56-page catalog contains specifications and construction data and over 100 detailed illustrations.

Airless Blast Cleaning

American Wheelabrator & Equipment Corp., 1783 So. Byrkit St., Mishawaka, Ind., has published a new bulletin describing blast cleaning by airless means in a tumble-type machine. Advantages of the process are detailed for production cleaning of castings, forgings, heat-treated parts, weldments, etc. Other applications include paint removal, and other cleaning work in connection with reconditioning automotive parts.

A section of the bulletin is illustrated with installation views. Operation of the machine is explained and pictures of typical parts processing are shown. Complete electrical and mechanical specifications are included.



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FEATURES All brass construction, nickel finish, cork insulation.

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35 years continuously in the diesel engine game

Write for catalog.

DIESEL PLANT SPECIALTIES CO.

Stevens Point, Wisconsin

What Do You Know!

(*Answers to questions on page* 52)

1. Correct answer is "b". When dimensional conditions change in the cylinder, a different ring setup may be advantageous to control lubrication and blowby. For details, see article starting on Page 46.

2. "a" is correct. Piston rings must meter sufficient oil to cylinder walls for proper lubrication. If setup is too drastic, lubrication will be reduced to the point where scuffing and seizure occur. See article mentioned above.

3. Most pertinent answer is "c". Sets of this type usually run on No. 2 fuel and viscosity is little problem. Also, very little heat would be added to the cylinder. Wax is the bad boy in cold climates when present. See article on Page 56 for description of such a set.

4. Correct answer is "b". The low-tension magneto delivers its impulse to the transformer, which in turn provides energy to spark plug. See article on Page 28 for details.

5. "b" is correct. Similar construction is used for highline insulators. See article mentioned above.

6. Correct answer is "c". In the other cases, a battery must be floated on the line to hold voltage steady. See article mentioned above.

7. Correct answer is "b". Considerable testing by ignition manufacturers and research groups have shown the condition to have no effect. See article mentioned above.

8. Correct answer is "e". This is the heaviest plating (0.030-in on the diam) practical before difficulty is encountered. For discussion, see article on Page 49.

9. "b" is correct. Size is important as it affects velocity of air passing through cleaner. For discussion, see article on Page 54.

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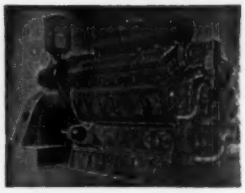
for IMMEDIATE SHIPMENT
Unit Capacities 100 to 1875 Kva A.C. 50-60 Cycles Various Voltages



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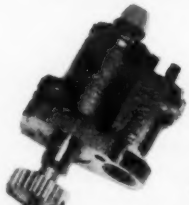
"ENGINEERED TO YOUR INDIVIDUAL NEEDS"

*UNIFLO T.M. Reg. *Send for Bulletin # M-728*

MARINE PRODUCTS & ENGINEERING CO.
20 VESEY ST., NEW YORK 7, N. Y. REctor 2-7863

Production Reconditioning of GMC and CAT Diesel Fuel Injection Equipment



Plungers and Bushings
GM 71—$ 5.50
GM 567—$10.55
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Complete Injectors
GM 71—$11.90
GM 110—$18.75

Cat pumps—(Any size) $16.00
Cat nozzles—(Any size) $10.70

Dealer propositions

Send in your worn pumps and injectors, to

HANCOCK DIESEL SERVICE
300 Walnut Street Findlay, Ohio

Insist on VELLUMOID for Quality
GASKETS AND SHEET PACKING
FOR OIL, WATER AND GASOLINE
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news of our industry

1954 Plant Construction Trend

Industrial and process plant construction during 1954 will continue at substantially the same high level as 1953, officers of the National Constructors Assn. predicted at their annual meeting in New York recently. Current high level of employment in the industry was listed as a strong indication of the trend.

Employment figures filed with the association, monthly, show that member companies had a total employment 10 per cent higher at the end of 1953 than at the beginning of the year. While this includes only direct employees of member companies and not sub-contractors, it is said to be indicative of the level of activity in the industry.

Correction Please!

We are guilty of perpetrating an error in source material. In our April issue, on page 101, we stated that the weight of the World's Largest Engine was about 240,000 lb. This figure, however, is slightly less than the weight of the crankshaft alone. The engine weighs about 1400 ton.

Australia Orders Budd RDCs

Two modified versions of Budd Rail Diesel Cars have been ordered by the Queensland Government Railways of Australia. The Budd Co. announces. The order follows by about three years the introduction and successful operation of this type of equipment on another Australian railway.

The modified version is built for a narrow gauge—3 ft, 6 in—and will be about 55-ft long rather than the conventional 85 ft. The cars will be powered by two 125-hp engines operating through torque converters which can drive in either direction. Although the cars will be assembled in Australia by Commonwealth Engineering Co., Ltd., the company's Australian associate, Budd will prefabricate some of the stainless steel parts at its plant in Philadelphia.

Alco Opens New Parts Depot

A new diesel locomotive parts warehouse and office, built to serve more than 50 railroads in the Southwest, has been formally opened in St. Louis, Mo. by the American Locomotive Co. Approximately 5000 parts will be stored to service more than 1100 Alco locomotives operated in this region of the United States. Provision has been made for future storage space addition and for possible erection of a diesel engine and locomotive rebuild and repair shop.

In addition to dedicating its new facility, Alco delivered its 10 millionth diesel horsepower, contained in a dual-purpose 1600-hp road locomotive, to the Missouri Pacific Railroad. Executives of more than a dozen railroads and Midwest industrial leaders attended the ceremony.

Delivery of its 10 millionth horsepower coincides with the 30th anniversary of delivery by the company of the nation's first commercially successful diesel unit. This was a small, 300-hp yard switcher which was built for the Central Railroad of New Jersey in 1924 and is still in daily use.

NEED A MAN
TRAINED IN
DIESEL TRACTORS,
HEAVY EQUIPMENT?
A number of qualified men, trained in protective maintenance and general overhaul of diesel engines, tractors and heavy equipment are available for U.S. or foreign employment. Write for list of names and addresses. No obligation.
INTERSTATE TRAINING SERVICE
Dept. A-28-F PORTLAND 13, OREGON

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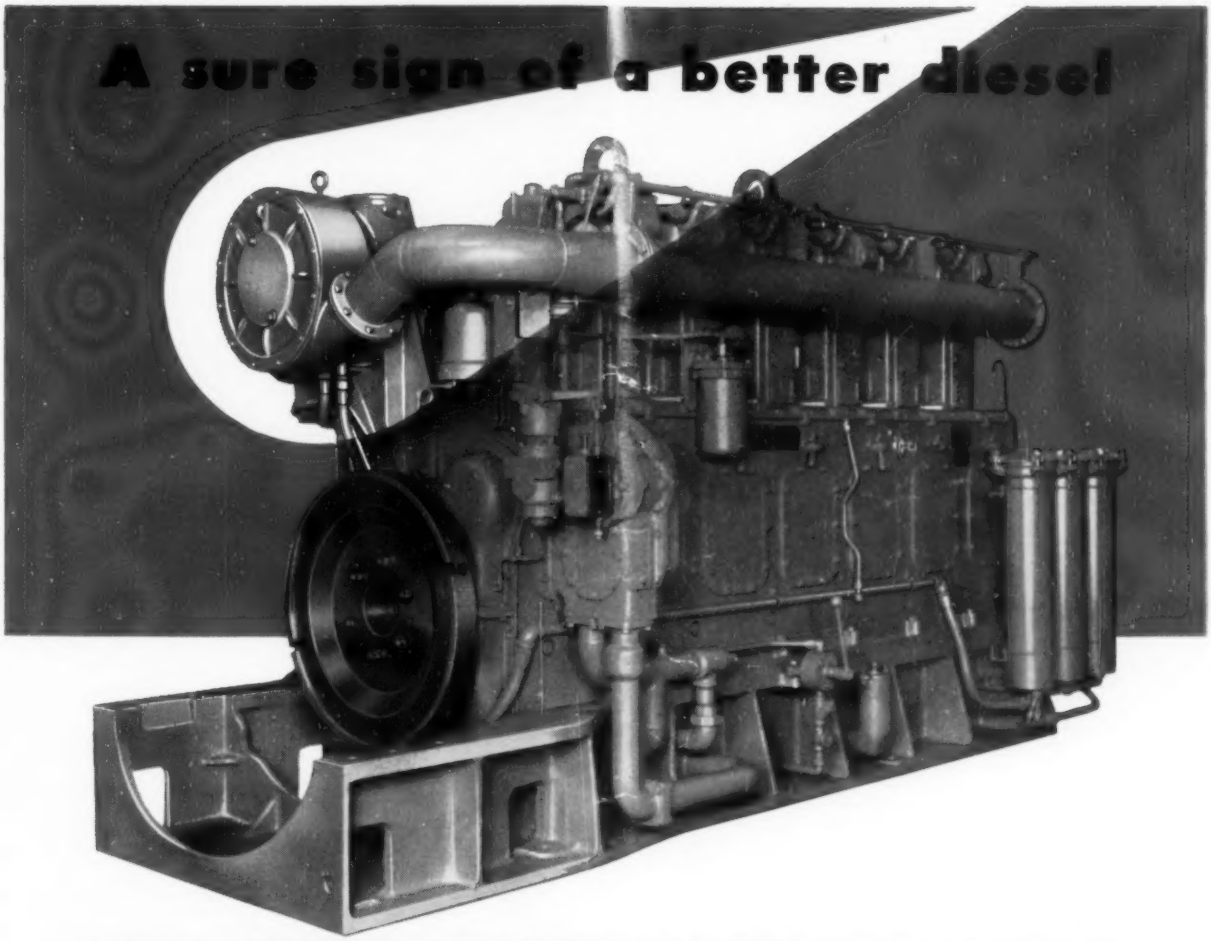
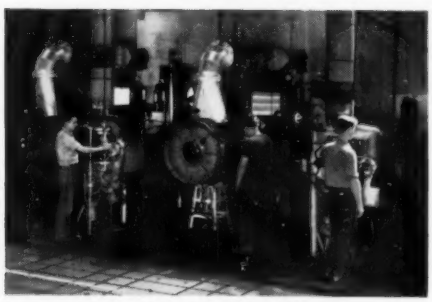


ELLIOTT TURBOCHARGERS



THF TURBOCHARGER TEST LINE

There's nothing experimental about Elliott turbochargers. Elliott has been designing and building them for years and has long since solved the complex thermodynamic and volumetric relationships involved. A comprehensive research and testing program always improves present standards of turbocharging and assures every diesel operator even better performance and value in the years to come.

When a diesel engine manufacturer wants to boost the power and performance of one of his engines, he naturally equips it with an Elliott turbocharger.

There's good reason for this, too. Elliott turbochargers now offer the following outstanding advantages:

- Improved efficiencies
- Higher pressure ratios
- More air flow
- Lower weight/horsepower ratios
- Lower specific fuel rates
- Less lube oil consumption
- Greater capacity to handle overloads
- Better scavenging
- Improved thermal efficiencies

Translated into terms of dollars and cents, Elliott turbocharging means that you stretch your power dollar further – you avoid many costly diesel maintenance problems – and you get longer profit-producing service from your engine . . . all good, sound economic reasons why it pays to specify Elliott turbocharging when you're investing in diesel powered equipment.

If you'd like further details, write the Elliott Company, Jeannette, Pa.

ELLIOTT Company

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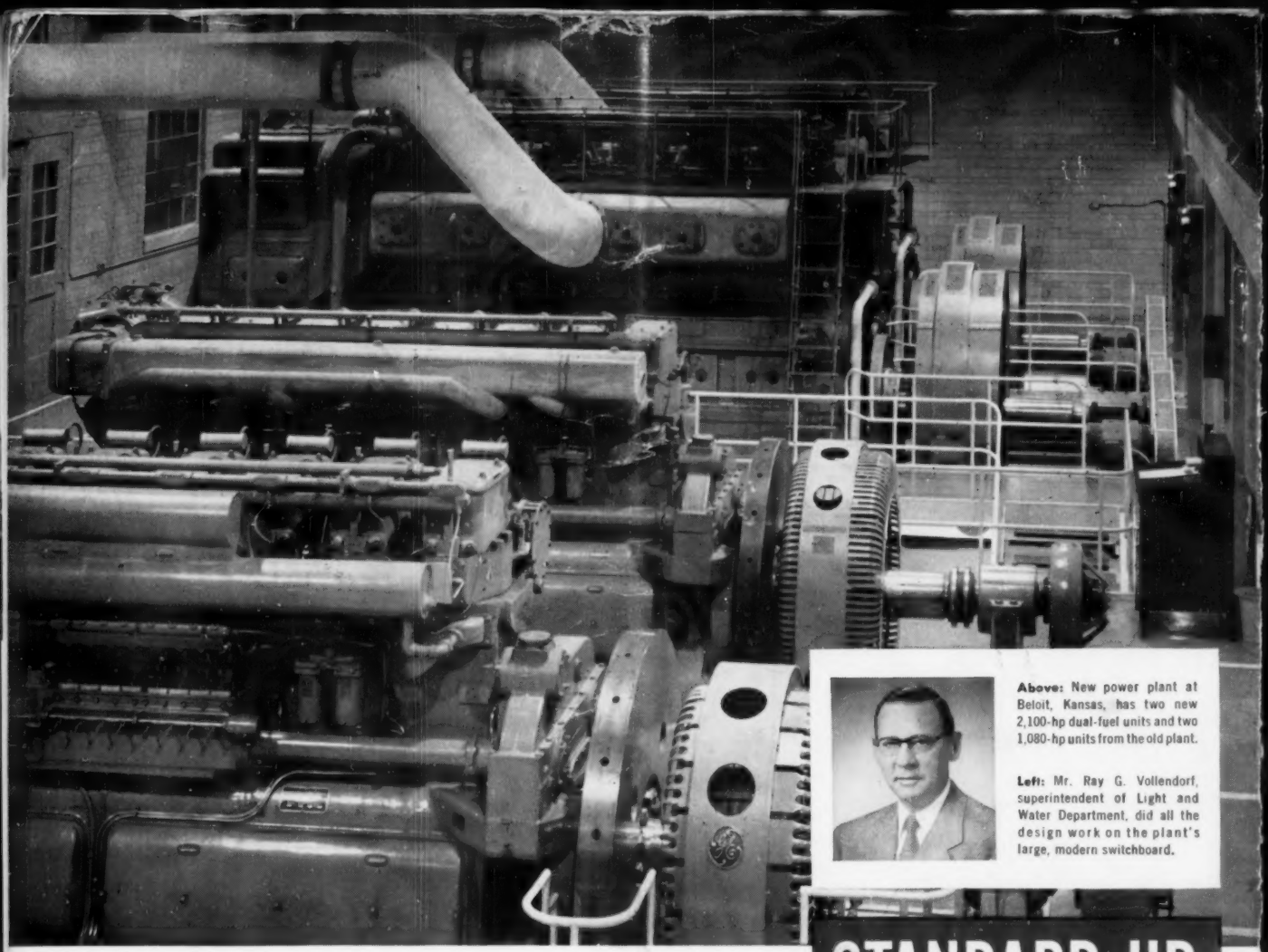

Above: New power plant at Beloit, Kansas, has two new 2,100-hp dual-fuel units and two 1,080-hp units from the old plant.

Left: Mr. Ray G. Vollendorf, superintendent of Light and Water Department, did all the design work on the plant's large, modern switchboard.

STANDARD HD
TRADE MARK
OIL

New Beloit, Kansas, plant gets record low maintenance with...

● Acclaimed as one of the municipal showplaces of the Midwest, the new power plant at Beloit, Kansas, is going itself one better in actual performance.

The decision of Mr. Ray Vollendorf, plant superintendent, and city officials to switch to dual-fuel operation has paid dividends. Dual-fuel operation of the two new 2,100-hp units and a 1,080-hp converted unit has reduced fuel cost per kilowatt hour by more than 50%.

Another decision has brought its reward. To STANDARD HD Oil went the job of lubricating the plant's four diesels. Now, after nearly three years' operation, Mr. Vollendorf reports that crankcases are as clean as the day the diesels were placed in service. No rings or bearings have needed to be replaced. Visibility of tool marks on the rings and the over-all excellent condition of the engines indicate that many more hours of service are possible before any overhaul or replacement of parts will be required.

Including the three years' operation of the new plant, the experience of Beloit, Kansas, municipal officials with Standard Oil products covers over 20 years. That experience testifies to the satisfaction and benefits you'll realize through Standard Oil's high quality products and outstanding service. You can reach the Standard lubrication specialist in your area of the Midwest by phoning your local Standard Oil office. Or, write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois.

STANDARD OIL COMPANY

STANDARD *(Indiana)*